City of Stockton
Climate Action Plan

August 2014







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Acronyms and Abbreviations

20X2020 goal	SB X7-7, 20% reduction in urban per capita water use by December 31, 2020
AB	Assembly Bill
ARCA	Appliance Recycling Centers of America
ATV	all-terrain vehicles
BAU	business as usual
BMP	best management practice
BRT	bus rapid transit
CAA	Clean Air Act
CAFE	Corporate Average Fuel Economy
CalEPA	California Environmental Protection Agency
CALGREEN	California Building Standards Commission Title 24 Part 11
CAP	Climate Action Plan
CAPAC	Climate Action Plan Advisory Committee
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CCA	Community Choice Aggregations
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CH_4	methane
CHP	combined heat and power
City	City of Stockton
cm	centimeters
CO_2	carbon dioxide
CO_2e	CO2 equivalent
COSMUD	City's Municipal Utilities Department
CPUC	California Public Utilities Commission
DOE	U.S. Department of Energy
EECBG	Energy Efficiency Community Block Grants
EMP	Energy Management Plan
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESPs	energy service providers
GHG	greenhouse gas
GWP	global warming potential
HFC	hydrofluorocarbon
IOUs	investor-owned utilities
IPCC	Intergovernmental Panel on Climate Change
LCFS	Low Carbon Fuel Standard
LED	light emitting diode

LGOP	Local Governments Operations Protocol
LGOP	Local Governments Operations Protocol
MPO	metropolitan planning organization
MT	metric ton
MW	megawatt
N_2O	nitrous oxide
NGO	nongovernmental organization
NSHP	New Solar Homes Partnerships
ODS	ozone-depleting substances
PFC	perfluorinated carbon
PG&E	Pacific Gas and Electric
ppb	parts per billion
ppm	parts per million
ppt	parts per trillion
RAD	Responsible Appliance Disposal
REC	renewable energy credit
RPS	Renewables Portfolio Standard
RTD	Regional Transit District
RTP	Regional Transportation Plan
RWCF	Regional Wastewater Control Facility
SAR	IPCC Second Assessment Report
SB	Senate Bill
SF_6	sulfur hexafluoride
SHP	separate heat and power generation
SJCOG	San Joaquin Council of Governments
SJVAPCD	San Joaquin Valley Air Pollution Control District
U.S.	United States
UNFCCC	United Nations Framework Convention on Climate Change
Valley CAN	Center Valley Clear Air Now
VMT	vehicle miles traveled
WRI	World Resources Institute

Executive Summary



Introduction

California adopted Assembly Bill (AB) 32, in 2006. AB 32, also known as the Global Warming Solutions Act of 2006, established a statewide reduction goal to reduce greenhouse gas (GHG) emissions levels back to 1990 levels by the year 2020. This goal was developed as a near-term 2020 reduction target in light of the understanding of the overall global reductions in GHG emissions needed to reach to begin stabilizing carbon dioxide (CO_2) emissions by 2050. Based on the current understanding of climate science, substantive additional reduction effort will be required globally after 2020 in order to avoid the more catastrophic effects of climate change later in the century.

Consistent with the State of California's objectives outlined in AB 32, the City of Stockton (City) adopted Policy HS-4.20 in its 2035 General Plan to reduce GHG emissions generated by the community. Specifically, Policy HS-4.20 sets forth the following initiative:

> Adopt new policies, in the form of a new ordinance, resolution, or other type of policy document, that will require new development to reduce its greenhouse gas emissions to the extent feasible in a manner consistent with state legislative policy as set forth in AB 32 (Health & Saf. Code, 38500 et set.)[.]

As a condition for approval of the 2035 General Plan, the City entered into a Settlement Agreement with the Sierra Club and the California Attorney General's Office in October 2008 (Appendix A). The Settlement Agreement (described below) was enacted to ensure future growth outlined in the 2035 General Plan addresses GHG emissions in a meaningful and constructive manner. This Climate Action Plan (CAP) outlines a framework to feasibly reduce community GHG emissions in a manner that is supportive of AB 32 and is consistent with the Settlement Agreement and 2035 General Plan policy.

The City of Stockton is facing a deep economic challenge that inhibits the extent to which the City can engage in ambitious GHG reduction measures that would require short- or long-term private or public investments and financing at this time. While the City seeks to reduce GHG emissions from both existing and new development, the CAP has considered the financial limitations of both City government and the Stockton community as a whole. As described in the CAP, the City would revisit this plan in the future to examine whether there exist additional options to further reduce GHG emissions, and whether such options might be feasible in improved economic conditions. If the CAP is adopted by the City Council, the City would still move forward with feasible GHG reduction efforts, even in this time of stark economic conditions, to do its fair share to help California as a whole meet the commitment made with AB 32.

The CAP relies on numerous voluntary measures for both existing and new development, but also includes a number of mandatory measures where required by other state or local existing mandates and other City initiatives. As an example, under SB X7-7, the City is required to reduce water use on a per capita basis by 20 percent below 2005 levels by 2020; implementing this mandate would also help to reduce GHG emissions. The CAP also continues existing City practice of requiring new development to reduce emissions by 29 percent compared to "business as usual" conditions, which is consistent with the recommendations of the San Joaquin Air Pollution Control District. However, the CAP seeks to avoid placing undue burdens on existing or new development that might otherwise

impede economic recovery in Stockton and thus balances the need for economic growth and the need for GHG emissions reductions.

Settlement Agreement

The Settlement Agreement was signed in October 2008 between the City of Stockton, the Attorney General of California, and the Sierra Club. The Settlement Agreement resolved a lawsuit filed by the Sierra Club and threatened to be joined by the State Attorney General challenging the adequacy of the Environmental Impact Report for the City's 2035 General Plan.

The Settlement Agreement includes the following requirements:

- **Climate Action Plan.** The Agreement requires preparation of a CAP and submittal to the City Council for adoption. The Agreement does not require actual City Council adoption of a CAP. *The CAP is intended to meet this requirement.*
- **Climate Action Plan Advisory Committee (CAPAC).** The Agreement requires formation of an advisory committee. *The CAPAC has been formed and has been involved in the development of the Green Building Ordinance, the CAP, and review of other Agreement requirements.*
- **Climate Action Plan Requirements.** The Agreement requires the CAP to include GHG inventories, identify goals for reducing GHG emissions and vehicle miles travelled (VMT), and identify measures to reduce GHG emissions. *These are included in the CAP and the plan would result in VMT growth less than population growth as required by the Agreement.*
- **Green Building Program.** The Agreement requires development and consideration of a green building program and associated measures. *The City adopted a Green Building Ordinance and the Green-Up Stockton Ordinance in compliance with this part of the Agreement. The Green Building ordinance presently suspended pending consideration of potential revisions. The City has considered a local assessment district (consistent with AB 811) for residential buildings, but has put this on hold in light of the mortgage restrictions of Fannie Mae and Freddie Mac. The CAP calls for establishing a local assessment district for non-residential buildings, which are not hindered by the restrictions of Fannie Mae and Freddie Mac.*
- **Transit Program/Transit Gap Study**. The Agreement requires development of transit studies and a transit program. *A transit gap study was completed and a transit program was developed; the transit program is included as Appendix D of the CAP for ultimate consideration by the City Council.*
- **Infill/Downtown Development**. The Agreement requires the City to develop General Plan policies or programs to support infill/downtown development and submit to the City Council for adoption. The Agreement does not require actual City Council adoption of such policies or programs. *The City is developing General Plan amendments separately from the CAP to assure 4,400 housing units by buildout in the Greater Downtown area, 14,000 units within the 2008 City limits by buildout, and to incentivize infill including a goal of 3,000 units by 2020 for the Greater Downtown area.*
- **Projects outside the City Limits.** The Agreement required development of project approval criteria for projects outside the City Limits. *The City is evaluating General Plan amendments separately from the CAP to provide criteria for review and approval of projects outside the City Limits in relation to GHG emissions, services, and transit support for City Council consideration.*

- **Monitoring.** The Agreement requires monitoring of program elements. *The City would track any measures and strategies that are adopted pursuant to the CAP or other Settlement Agreement elements.*
- **Early Climate Protection Actions.** The Agreement required development of certain early climate protection actions. *The City has developed a Climate Impact Study Process and is evaluating GHG emissions for projects in this interim period before CAP adoption.*

Overview of the Climate Action Plan

Purpose of the Climate Action Plan

The primary purpose of the CAP is to satisfy the Settlement Agreement by designing a feasible strategy to reduce community-generated GHG emissions, consistent with statewide GHG reduction efforts for consideration and potential adoption by the City Council.

Development of the Climate Action Plan

The City established the Climate Action Plan Advisory Committee (CAPAC) to assist in developing a feasible and robust CAP that considers all aspects of the community and environment. The CAPAC consists of representatives from environmental, non-profit, labor, business, and development interests.

With the assistance of the CAPAC, the City began working on an inventory of GHG emissions from community activities in fall of 2009. The methods, assumptions, and results of the analysis were provided to the CAPAC for public review and comment. The final GHG inventory was completed and accepted by the CAPAC in 2011.

Simultaneous with the inventory work, the City began researching feasible measures that could be taken to reduce GHG emissions. An extensive list of potential GHG reduction measures was developed and submitted to the CAPAC for technical review. Based on feedback provided by the CAPAC, the City selected candidate measures to analyze in greater detail. The amount of GHG emissions that could be avoided in 2020 by each measure was calculated. Costs associated with each measure were also quantified, as feasible, to help identify the financial and economic impact of the measures. Other benefits, such as reduction in air pollution, were also identified for all measures. The City also evaluated the methods of implementing different measures, including whether each measure should be implemented through incentive-based voluntary approaches, flexible performance-based measures, or through new local mandates.

Based on consideration of the GHG reduction effectiveness, financial and economic costs of measures, and benefits, the City identified a list of voluntary and mandatory measures for inclusion in the CAP.

Stockton's Community Greenhouse Gas Emissions

GHG emissions from "community activities" include those occurring in association with the land uses within the City's jurisdictional boundary, and generally consist of sources of emissions that the

City's community can influence or control. Emissions generated by the City's municipal operations (e.g., City-owned facilities, vehicle fleets) are not individually highlighted in the Draft CAP. However, emissions generated by the City's municipal operations occurring within the City's jurisdictional boundaries are encapsulated in the overall community emissions inventories and subject to the CAP. Municipal emissions represent approximately 2 to 3% of the City's 2005 community inventory (City of Stockton 2010).

The City inventoried GHG emissions from community activities in 2005 and then backcasted and forecasted those emissions to 1990 and 2020, respectively. The GHG emissions inventory utilized methodologies and procedures approved by the State and local air quality management agencies. The primary protocols consulted for the analysis were:

- Local Governments Operations Protocol (LGOP) for the quantification and reporting of greenhouse gas emissions inventories (California Air Resources Board 2010a).
- 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (IPCC 2006).
- 2009 General Reporting Protocol (Version 3.1) for reporting entity-wide GHG emissions (California Climate Action Registry 2009).

The 2005 inventory includes GHG emissions that are either under the jurisdiction of the City or that occur in association with the land uses within the city limits. The 2005 inventory represents the *baseline* inventory, or the existing emissions level for CAP analysis purposes.

The 2020 emissions projection is a prediction of how community emissions may change by 2020, in the absence of state and local actions to reduce greenhouse gases. The 2020 emissions projection is called the *business as usual* (BAU) scenario, and is based on the expected growth in City population, employment, and housing. Similar to the 2020 BAU forecast, the 1990 emissions projection represents an estimate of community emissions in 1990. This analysis is called the *emissions backcast*, and is based on 1990 socioeconomic factors.

As is the standard practice, the GHG inventories are presented in metric tons (MT) of CO_2 equivalent (CO_2e) in all Stockton CAP figures and tables, unless otherwise denoted. Presenting inventories in CO_2e allows one to characterize the complex mixture of GHG as a single unit taking into account that each gas has a different global warming potential (GWP).

Baseline (2005) Greenhouse Gas Emissions

Total emissions for the City in 2005 were 2,360,932 MT CO_2e (Table ES-1 and Figure ES-1). The largest source of emissions for the City was on-road transportation, which represented 48% of total community emissions. Transportation emissions are often the largest source of emissions in community inventories. Building energy emissions are the second largest source of emissions and accounted for 33% of total community emissions. The building energy sector includes emissions associated with natural gas combustion and electricity consumption in residential, commercial, and industrial buildings and other uses in Stockton. The third largest source was off-road equipment, which contributed 8% of the total 2005 emissions. The remaining sources in order of greatest contributions were high Global Warming Potential (GWP) GHGs (4%), wastewater treatment (4%), solid waste management (3%), water importation (0.4%), and agriculture (0.04%).

1990 Backcast and 2020 Business as Usual Forecast

Community wide, BAU emissions are projected to increase by approximately 13% from 2005 to 2020. The increase will occur primarily because of increases in VMT, building energy and water use, and wastewater generation due to population and employment growth. As shown in Table ES-1, transportation emissions and building energy are expected to increase by 9% and 17% between 2005 and 2020, respectively; water and wastewater emissions are expected to grow by 42% and 11%, respectively.

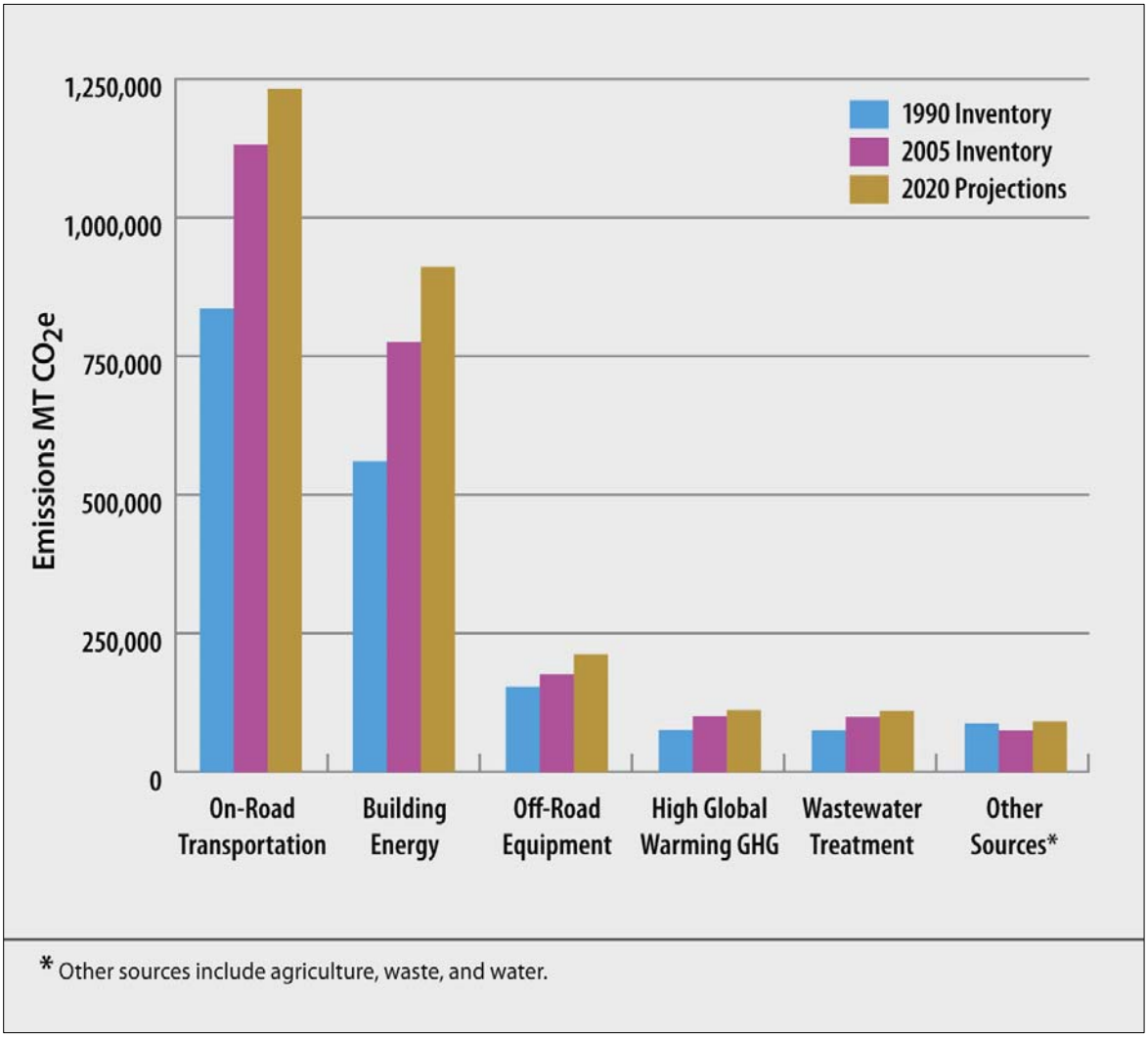
Table ES-1. City of Stockton Community GHG Inventories: 1990 Emissions Backcast, 2005 Baseline, and 2020 BAU Forecast (MT CO_2e)[a]

	1990		2005		BAU 2020	
Emissions Sector	MT CO_2e	% of Total	MT CO_2e	% of Total	MT CO_2e	% of Total
Agriculture	928	0.05%	928	0.04%	928	0.03%
Building Energy	560,993	31.3%	776,186	32.9%	911,272	34.1%
High Global Warming GHG	76,444	4.3%	100,931	4.3%	112,478	4.2%
Off-Road Equipment	154,233	8.6%	176,431	7.5%	213,300	8.0%
On-Road Transportation	836,037	46.7%	1,132,265	48.0%	1,232,663	46.1%
Solid Waste Management [b]	79,939	4.5%	65,720	2.8%	78,347	2.9%
Wastewater Treatment	75,569	4.2%	99,777	4.2%	111,191	4.2%
`Water Importation	6,977	0.4%	8,694	0.4%	12,340	0.5%
Total Emissions	1,791,120	100%	2,360,932	100%	2,672,519	100%

[a] For more information, see Appendix B.

[b] Note that solid waste management emissions decline between 1990 and 2005 and then increase between 2005 and 2020. This is because the landfill profile between 1990 and 2020 changes. More specifically, the number and efficiency of methane capture systems is highest in 2005, which results in the dip in emissions, compared to 1990 and 2020.

Figure ES-1. City of Stockton Community GHG Inventories: 1990 Emissions Backcast, 2005 Baseline, and 2020 BAU Forecast (MT CO2e)



Stockton's Greenhouse Gas Emissions Reduction Target

The California Air Resources Board (CARB), which is the lead agency empowered to implement AB 32, adopted the AB 32 Scoping Plan in December 2008, which is a policy document outlining the state's approach to meeting the AB 32 GHG reduction targets. In the Scoping Plan, CARB recommended, but did not require, an emissions reduction goal for local governments of 15% below "current"[1] emissions to be achieved by 2020 (California Air Resources Board 2008). Based on this recommendation, the City identified an interim GHG emissions reduction goal for the purposes of initial CAP development of 15% below 2005 levels.

During development of the CAP, the City evaluated the effect of the state's reduction measures and evaluated a wide range of potential local GHG reduction measures to examine the feasibility, cost, and benefits of potentially meeting the interim reduction target. Although technically feasible to meet the interim reduction target, it is the City's judgment that meeting the target would require some measures or actions that are infeasible under current economic conditions in Stockton and which would result in short- and near-term financial impacts that could affect economic recovery in Stockton, and that would affect Stockton's ability to invest in energy efficiency and other GHG reduction strategies in the long run. While some of the initially identified reduction strategies would result in long-term economic benefits, particularly for measures regarding energy efficiency, the City finds that the economic climate limits the extent of measures that the City can propose and commit to at this time. With changes in future economic conditions, the City and the community may choose to implement more ambitious GHG reductions.

At the time of development of the AB 32 Scoping Plan in 2008, the state's GHG inventory had been completed only from 1990 through 2004, with a forecast to 2020. If one interpolates between the 2004 and 2020 emission estimates at the time of the AB 32 Scoping Plan, one finds that CARB's recommendation of 15% below "current" levels roughly corresponds to 15% below 2008 levels as they were projected at the time. Subsequent to the AB 32 Scoping Plan, CARB completed state inventories for 2005 to 2010. Using this new data, statewide 1990 emissions (433.29 million MT CO_2e) are equivalent to 10%[2] below 2005 levels (482.09 million MT CO_2e).[3] In light of this updated data and the evaluation of feasibility described above, the City now proposes approximately 10%[4] below 2005 levels as its GHG reduction goal which would be consistent with the level of reductions needed at the state level to meet the AB 32 goal, compared to statewide 2005 levels

The measures described in the City of Stockton CAP would, if fully implemented, result in 2020 emissions that meet this reduction target, as shown in Figure ES-2.

The CAP would require substantial effort on the part of the entire Stockton community, including residents and business, schools, the San Joaquin Regional Transit District, other public entities, and the Stockton municipal government at a time when residents, businesses, and public agencies are struggling to pay current bills, keep businesses open, and provide basic services. This plan, if fully implemented, would result in a 20% reduction in per capita GHG emission from 2005 to 2020. Compared to the statewide effort needed to meet AB 32, for the land use sector (e.g. excluding heavy industrial sources, marine transportation, etc., which are not included in Stockton's local inventory),

[1] "Current" as it pertains to the AB 32 Scoping Plan is commonly understood as sometime between 2005 and 2008.

[2] Actually 10.12%.

[3] See Appendix E for calculations.

[4] Actually 10.12%.

the state would need to reduce per capita GHG emissions from the land use sector from 10.0 MT/person in 1990 to approximately 7.4 MT/person in 2020. Implementation of the CAP would result in reducing Stockton's emissions from approximately 8.5 MT/person in 2005 to 6.8 MT/person in 2020, which is slightly less than the state goal in 2020 (see data in Appendix E). While some communities in California, particularly those with relatively better economic conditions or lower levels of projected growth compared to Stockton, might be able to achieve relatively greater reductions in GHG emission, given the City's severe economic constraints, this Plan would represent no less dedication and effort to helping California reach the GHG reduction goals in AB 32.

Stockton's Greenhouse Gas Reduction Plan

Overview of the Greenhouse Gas Reduction Measures

The City's CAP includes existing and proposed state and local measures that would result in GHG emissions reductions within the community.[5] State mandates do not require additional local action, but would result in local GHG reductions and would often require local effort. For example, a number of state regulations will improve the fuel efficiency of vehicles and reduce the carbon content of electricity. Vehicles that travel on City roadways, as well as electricity provided to the City, will therefore be cleaner and less GHG intensive than if state mandates had not been established. Statewide energy efficiency mandates require that new buildings must include additional energy efficient improvements. State commercial recycling mandates will require greater effort in recycling for commercial buildings.

To supplement statewide initiatives, the City has identified a series of voluntary, performance-based, and mandatory reduction measures that are either currently being implemented, or would be implemented by the City. The reduction measures can be grouped into eight broad emission sectors, which would affect emissions throughout community activities. The measures include programs that improve building energy efficiency, increase transit and alternatives to vehicular travel, increase use of renewable energy, reduce water consumption, reduce waste and other measures. Table ES-2 summarizes the City's list of proposed reduction measures by emissions sector.

[5] At present, the only federal mandate that would specifically reduce GHG emissions in Stockton are the Corporate Average Fuel Economy (CAFE) standards. These standards were adopted to be consistent with previously passed California vehicle efficiency standards per AB 1493 (Pavley). As a result, these standards are subsumed in the state regulations. The federal government is considering new CAFE standards for 2017 to 2025 at this time, while CARB is pursuing the Advanced Clean Car initiative. It is expected that California standards, as they have in the past, will eventually become federal standards, and thus, the Advanced Clean Car standards are presumed to take effect in California in 2017.

Table ES-2. Summary of GHG Reduction Measures

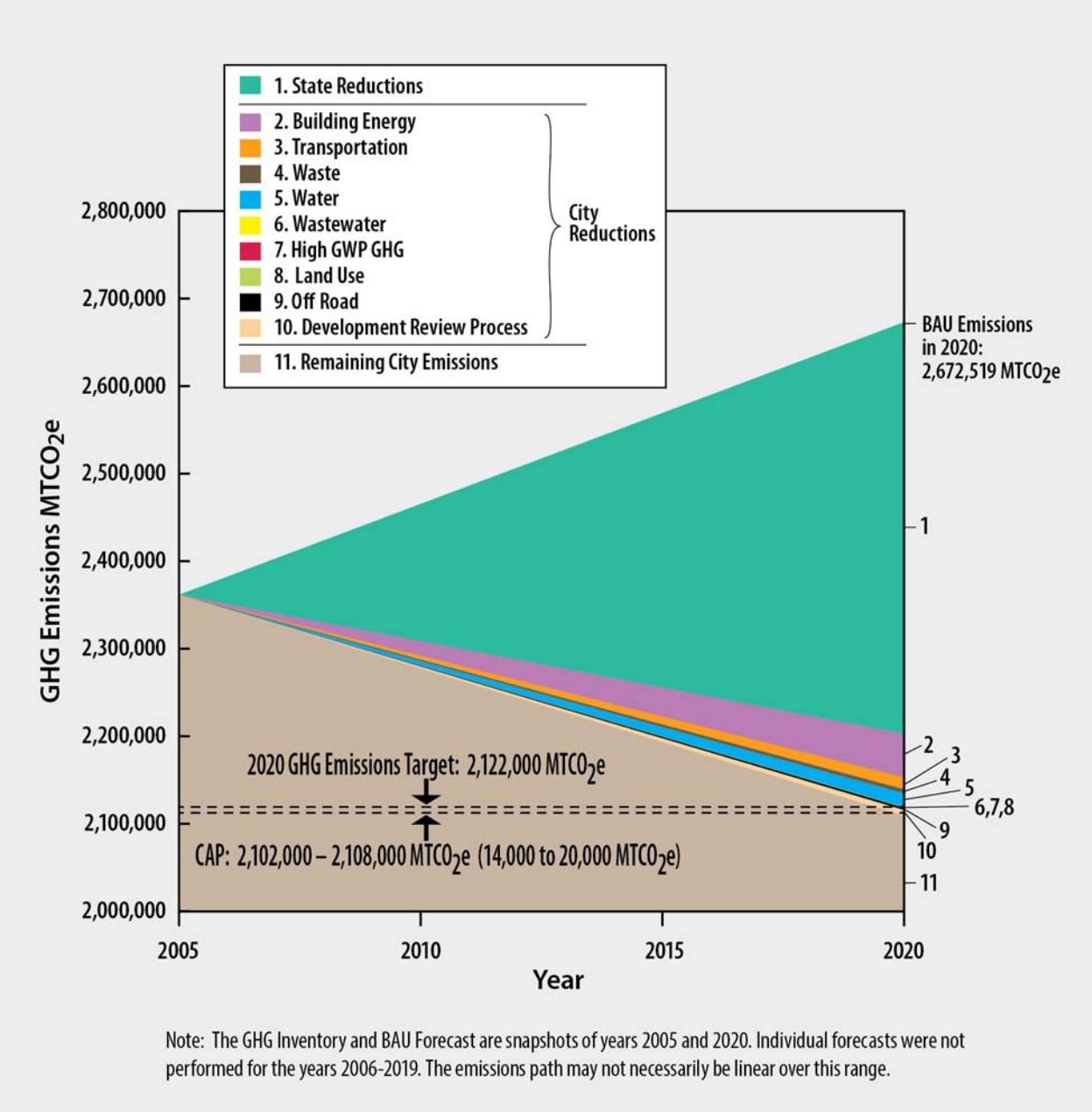
Measure Number	Measure Description
Multi-Sectoral	
DRP-1	Development Review Process—29% reduction for discretionary projects [M]
Building Energy	
Energy-1[a]	Green Building Ordinance [M]
Energy-2a	Outdoor Lighting Municipal Upgrades [CITY]
Energy-2b	Outdoor Lighting Private Upgrades [V]
Energy-3	Energy Efficiency Programs to Promote Retrofits for Existing Residential Buildings [V]
Energy-4	Energy Efficiency Programs to Promote Retrofits for Existing Non-Residential Buildings [V]
Energy-5	Solar-Powered Parking [V]
Energy-6	Residential and Non-Residential Rooftop Solar [V]
Land Use and Transportation	
Trans-1	Land Use/Transportation System Design Integration [CITY]
Trans-2	Parking Polices [M]
Trans-3	Transit System Support [CITY]
Trans-4	Efficient Goods Movement [CITY]
Trans-5	Reduce Barriers for Non-Motorized Travel [CITY]
Trans-6	Transit System Improvements [CITY]
Trans-7	Safe Routes to School [CITY]
Trans-8a	Additional Safe Routes to School [CITY]
Trans-8b	Transportation Demand Management [V]
Waste Generation	
Waste-1	Increased Waste Diversion [M]
Water Consumption	
Water-1	Comply with Senate Bill (SB) X7-7 [M]
Water-2	Promotion of Water Efficiency for Existing Development [V]
Wastewater Treatment	
Wastewater-1	Energy Efficiency Improvements at the RWCF [CITY]
Urban Forestry	
Urban Forestry-1	Urban Tree Planting Programs [CITY]
High Global Warming Potential GHGs	
HGWP GHG-1	Residential Responsible Appliance Disposal (RAD) Programs [CITY]
Off-Road Vehicles	
Off-Road-1	Electric=Powered Construction Equipment [V]
Off-Road-2	Reduced Idling Times for Construction Equipment [M]
Off-Road-3	Electric Landscaping Equipment [V]

[a] The City's existing Green Building Ordinance is suspended pending consideration of certain revisions. Accordingly, GHG reductions achieved by Energy-1 have not been quantified as part of this document. Potential emissions reductions associated with the revised Green Building Ordinance will be assessed following approval by the CEC.
[V] = Voluntary for existing and new private development incentive-based approaches.
[M] = Mandatory program for existing and/or new development.
[CITY] = City Initiative.

Greenhouse Gas Emissions Reductions

Approximately 83% of the reductions needed to achieve the City's GHG reduction goal are achieved through state-level programs, and 17% are achieved through City-level programs. The largest GHG reductions are identified in the areas of building energy (both energy efficiency and renewable energy), transportation, and waste (Table ES-3 and Figure ES-2).

Figure ES-2. Summary of GHG Emissions Reductions by Sector (MT CO_2e)



Note: The GHG Inventory and BAU Forecast are snapshots of years 2005 and 2020. Individual forecasts were not performed for the years 2006-2019. The emissions path may not necessarily be linear over this range.

Table ES-3. Summary of GHG Emissions Reductions by Sector

GHG Emissions	MT CO_2e	Percent of Total Reduction (%)
State Programs	**473,415**	**83%**
Local Programs		
Development Review Process	4,963	1%
Building Energy Use Measures	49,271	9%
Land Use and Transportation Measures	13,619 to 19,360	2% to 3%
Waste Generation Measures	4,245	1%
Water Consumption Measures	16,228	3%
Wastewater Treatment Measures	312	0.1%
Urban Forestry Measures	75	0.0%
High GWP GHG Measures	255	0.0%
Off-Road Vehicle Measures	2,622	0.5%
Subtotal for Local programs	**91,590 to 97,331**	**16% to 17%**
Total Reductions	**565,005 to 570,746**	**100%**

The measures described in the CAP outline a path for reducing community emissions in conjunction with planned state actions. When combined with state efforts, the GHG reduction measures described in the City's CAP would enable the City to reduce its community GHG emissions by approximately 565,000 to 571,000 MT CO_2e, which would slightly exceed the emissions reduction target of 10%[6] below 2005 levels (which corresponds to approximately 551,000 MT CO_2e in GHG reductions). Actions not currently quantified (see Chapter 4), as well as local effects of the state's cap-and-trade program,[7] will likely contribute additional reductions to the City's goal.

Carbon offsets[8] were considered as a potential alternative option to reduce GHG emissions in Stockton. Carbon offsets are not proposed as a viable reduction measure at this time due to financial and cobenefit concerns. Financially, carbon offsets do not produce a return to the City of Stockton unless the offset project is located within Stockton itself. Thus, purchase of offset credits from offset providers outside of Stockton would not result in any economic return to Stockton residents or businesses. In addition, for offset projects located outside of Stockton, the City would receive none of the cobenefits of GHG reduction measures such as improvement in local air quality, reduction of traffic congestion, provision of local bike trails, residential or business energy savings or other benefits. Under the Development Review Process for new development, the City would remain open

[6] Actually 10.12%.

[7] The effects of California's cap-and-trade system, which started in 2013, are not included in the analysis in the CAP. However, it is expected that by 2020, the cap-and-trade system will result in additional reductions in the building energy and transportation sectors due to changes in energy prices directly (at the consumer level) or indirectly (at the producer level). It has been estimated that the cap-and-trade system might result in the following energy price changes by 2020: electricity (increase of 1% to 3%); natural gas (increase of 7% to 16%); gasoline (increase of 4% to 8%) and diesel (increase of 2% to 4%) (Source: CARB, Proposed Cap and Trade Regulation, Appendix N: Economic Analysis, 2010, Table N-3). Consumer response to these changes in energy prices might result in additional reductions in building energy and transportation fuel consumption beyond those included in estimates of the state and local measures included in the CAP, but are not estimated at this time.

[8] Carbon offsets are credits (in metric ton of CO_2e) generated through projects that voluntarily reduce their emissions. Offsets are validated by third parties using accepted protocols such as those of the Climate Action Reserve. Offset credits can be purchased directly from offset project proponents or through brokers.

to the potential use of offset credits to meet CEQA-required reduction amounts at a project by project level.

Local GHG reduction measures are discussed further in Chapter 3 of the CAP and the methodology used to quantify the measures is presented in Appendix C.

Cost Benefit Analysis

A quantitative and qualitative cost/benefit analysis was done of the GHG reduction measures included in this Plan. Wherever possible, the implementation and operational costs and savings were identified for the reduction measures in order to present the cost effectiveness in terms of dollars per ton of GHG reduced. Costs and savings were identified separately for the private sector and for the City government. An analysis of benefits was also done for each measure to identify the other benefits that could derive from GHG reduction measure implementation. Table ES-4 presents a summary of the GHG emissions reduced by each measure and the costs and savings of different measures and their benefits. Chapter 3 presents the estimated costs and savings for the City government and for the private sector. The cost-benefit analysis is discussed further in Chapter 3, and the methodology used to develop the analysis is presented in Appendix C.

Costs and Savings

The City has designed the CAP to rely, for the most part, on voluntary, incentive-based measures for existing development, flexible performance-based measures for new development, and only uses mandatory measures for new development where required by prior state or local mandates (such as for water conservation) or where advantageous to the City. By providing flexibility, the intent is that the City government, residences, and businesses would employ the most cost-effective methods to reduce GHG emissions.

The City of Stockton, private residents and businesses, and other public sector agencies, such as school districts, would incur costs to implement GHG reduction measures, but in many cases, they would also realize long-term savings resulting from reduced energy and maintenance costs that can help recoup initial investments. In the building energy sector, costs would be borne by building owners to upgrade to energy efficient technologies, In the transportation sector, many of the measures involve capital improvement projects and operational improvements that would be funded through a mix of local, state, and federal funding sources. Implementation costs for the City government would be associated with staff time to develop energy, waste, and transportation programs and ordinances as necessary; promote incentives for voluntary energy efficiency and renewable energy; supervise the Development Review Process, building, and fleet upgrades for City municipal operations, and implement new programs.

Some of the most cost-effective measures—and the biggest GHG reductions—can be found in the building energy sector. For example, investments to upgrade to energy efficient lighting and improve the energy efficiency of existing buildings can have payback times of as little as 1 to 5 years through reduced energy bills. Other measures have longer-term payback periods but can still have a positive net present value (i.e., their costs can be fully recouped in a reasonable amount of time). Other measures would represent net costs in the long-term, based on current energy prices, but may have shorter payback periods if energy prices increase in the future.

Measure Number	GHG Reduction Measure	GHG Reduction	Additional Cost of CAP?	Cost/Ton	Simple Payback Period	Lifetime	Net Present Value	Cobenefits	Notes
State Measures									
State Measures	Energy, transportation, waste, high GWP measures	473,415	No	Residents, business, City government, and other public agencies will incur additional costs for energy, transportation fuel and other expenses due to state initiatives, but will also incur savings where state requirements result in long-term efficiencies (like from Title 24 requirements). However, these costs and savings will occur with or without adoptions of the CAP. Other cobenefits similar to those articulated by sector below.					
Multi-Sectoral									
DRP-1	Development Review Process – 29% reduction for discretionary project	4,963	No	New project proponents will incur additional costs depending on the project level measures selected to meet the 29% reduction requirement. Building owners will incur savings where measures are adopted that result in energy-efficient structures and other measures. However, these costs and savings will occur with or without adoptions of the CAP. Cobenefits depend on measures selected.					
Building Energy									
Energy-1	Green Building Ordinance	N/A	No	Adopted ordinance has been suspended and revisions are under development. City consideration of ordinance is a separate matter from the CAP. CAP does not assume any reductions at this time from the ordinance. When the new ordinance is better defined, the City will evaluated potential GHG reductions beyond those assumed for Title 24 now and in the future					
Energy-2a	Outdoor Lighting Upgrades (Municipal)	496	Yes	-$325	5 to 13	5 to 17	$16,000,000	• Reduced energy use • Energy security and diversity • Reduced price volatility • Reduced air pollution • Resource conservation • Increased property value • Public health improvements • Increased quality of life	New municipal lighting program. After installation maintenance is same or less than current lights.
Energy 2b	Outdoor Lighting Upgrades (Private)	1,702	Yes	-$1,149	2 to 3	9 to 11	$1,800,000		New energy efficiency program (Energy-2a, 3, and 4).
Energy-3	Energy Efficiency Programs to Promote Retrofits for Existing Residential Buildings	20,182	Yes	-$247	4 to 9	18	$58,000,000		
Energy-4	Energy Efficiency Programs to Promote Retrofits for Existing Commercial Buildings	10,227	Yes	-$423	1 to 2	18	$51,000,000		
Energy-5a	Solar Powered Parking (Owner-financed)	1,586	Yes	-$10	13 to 17	30	$500,000		New solar program (Energy-5 and Energy-6)
Energy-5b	Solar Powered Parking (PPA-financed)		Yes	-$349	<1	25	$14,000,000		
Energy-6a	Residential and Non-Residential Rooftop Solar (Owner-Financed)	15,078	Yes	$60	17 to 20	30	-$27,000,000		
Energy-6b	Residential and Non-Residential Rooftop Solar (PPA financed)		Yes	-$208	<1	25	$79,000,000		
Land Use and Transportation									
Trans-1	Land Use/Transportation System Design Integration	1,440 - 7,181	Yes	Not estimated	Not estimated	>30	Not estimated	• Reduced energy use • Reduced air pollution • Public health improvements • Energy security • Increased quality of life	Net costs depend on cost differential between downtown development and outlying development and may be negative or positive. New program cost for City. RTD costs for potential transit service increase included separately in Transit Plan.
Trans-2	Parking Polices	1,557	Yes	Not estimated	Not estimated	9	Not estimated		New City program. Studies have shown parking enforcement pays for itself in terms of staffing for parking personnel as well as minor capital, and O &M costs. RTD costs for potential transit service increase included separately in Transit Plan.
Trans-3	Transit System Support	1,272	Yes	Not estimated	Not estimated	12/20	Not estimated		Park and ride, shelters, signals, etc.. Lifetime of 12 years for park and rise and 20 for bus shelters. RTD costs for potential transit service increase included separately in Transit Plan.
Trans-4	Efficient Goods Movement	767	No	Grade separations already planned and will be built with or without CAP.					Grade separations already planned and will be built with or without CAP.
Trans-5	Reduce Barriers for Non-Motorized Travel	1,459	Yes	-$1,317	2	20	$15,000,000		New program.
Trans-6	Transit System Improvements	--	Yes	--	Not estimated	--	Not estimated		Transit Plan represents investments to keep current transit share (3%) constant with population growth. No gain over BAU is presented, because BAU presumed same transit share as 2005. See Transit Plan in Appendix D for details.

Measure Number	GHG Reduction Measure	GHG Reduction	Additional Cost of CAP?	Cost/Ton	Simple Payback Period	Lifetime	Net Present Value	Cobenefits	Notes
Trans-7	Safe Routes to School	1,986	Yes	-$1,347	2	20	$33,000,000	• Reduced energy use • Reduced air pollution • Public health improvements • Energy security • Increased quality of life	New combined safe routes to school program (Trans-7 and Trans-8a)
Trans-8a	Additional Safe Routes to School	1,986	Yes	-$1,347	2	20	$33,000,000		
Trans-8b	Transportation Demand Management	3,152	Yes	Depends on TDM approaches	Net Cost	Depends on TDM approaches	Not estimated (net cost)		New voluntary TDM program.
Waste									
Waste-1	Increased Waste Diversion	4,245	In part	$942	Net Cost	9	-$31,000,000	• Reduced air pollution • Resource conservation	Existing but expanded program. Lifecycle material cost savings not estimated. Assumed ramps up to 75% diversion by 2020. Costs and savings would be borne directly by the waste management company, but costs likely to be passed on to residents, businesses, and the City.
Water									
Water-1	Comply with SB X7-7	9,680	No	State mandate. Residents, business, City government, and other public agencies will incur additional costs for water service and facilities, but will also incur savings for water efficiencie, but these will occur with or without adoptions of the CAP. Cobenefits same as for Water-2 below.					
Water-2	Promote Water-Efficiency for Existing Development	6,548	In part	$325	8	10	-$12,000,000	• Reduced energy use • Reduced air pollution • Resource conservation • Increased property value	Existing program but expanded.
Wastewater									
Wastewater-1	Energy Efficiency Improvements at the RWCF	312	Yes	-$308	2	5 to 10	$600,000	• Reduced energy use • Reduced air pollution	New program.
Urban Forestry									
Urban Forestry-1	Urban Tree Planting Programs	75	In part	-$1,375	Not estimated	40	$1,800,000	• Reduced energy use • Reduced air pollution • Reduced urban heat island effect • Increased quality of life	Existing program but expanded. Annual savings not constant but expand over time. Annual benefits quantified include electricity reduced, CO2 and air quality emission reductions, as well as property value increases. Total lifetime net savings per tree estimated at $0 for a small tree and $1,400 for a medium tree.
High Global Warming Potential GHGs									
HGWP GHG-1	Residential Responsible Appliance Disposal (RAD) Programs	255	Yes	Not estimated	Net Cost	9	Not estimated (net cost)	• Reduced air pollution	New program. Assumed to ramp up to full operation by 2020.
Off-Road Vehicles									
Off-Road-1	Electric Powered Construction Equipment	1,427	Yes	Not estimated	Not estimated	9	Not estimated	• Reduced air pollution • Public health improvements • Increased quality of life	New combined off-road program (Off-Road-1, 2, 3)
Off-Road-2	Reduced Idling Times for Construction Equipment	920	Yes	$586	3 to 30	9	-$4,200,000		
Off-Road-3	Electric Landscaping Equipment	275	Yes	Not estimated	Not estimated	9	Not estimated		
Total									
State Reductions		*473,415*	*No*	*Not Applicable*				*See above*	*Excludes unquantified costs. Net present value of entire program not fully quantifiable at this time as explained in text and in Appendix C.*
Local Reductions (Owner financed solar scenario, Trans-1/3000 units)		*97,331*	*Varies*	*See above*	*Varies*	*Varies*	*$136,500,000*		
Local Reductions (PPA financed solar scenario, Trans-1/300 units)		*91,590*					*$256,000,000*		
Total Reductions (Trans-1/3000 units)		*570,746*							
Total Reductions (Trans-1/300 units)		*565,005*							

Notes:
1. Source for Cost/Ton and Payback term estimates = Capital and O & M costs in Table 3-3 and Table 3-4 and cost source estimates in Appendix C.
2. Totals do not include potential RTD costs for Trans-1, 2, 3, and 6 which are discussed in Table 3-3.

A competitiveness analysis (EPS 2013) has been completed to analyze the potential net effects of CAP policies, programs, and financing measures on competitiveness of business in Stockton which is included in Appendix H. The competitiveness analysis concludes that the measures detailed in the CAP have been designed to minimize cost burdens on businesses and residents and thus the net competitiveness impacts are likely to be very limited or insignificant. The analysis notes that while introducing some new costs, the CAP would also create offsetting competitiveness benefits stemming from improved environmental conditions, quality of life, urban vibrancy, and other factors that influence attractiveness, reputation/brand, and innovation. The analysis also describes that CAP implementation will also result in financial returns on related investments and regional economic benefits which offset the limited negative cost-related competitiveness impacts.

Benefits

Many of the measures included in the CAP would result in long-term economic, environmental, health and other benefits for the City and its residents and businesses in addition to the expected GHG emission reductions.

Implementing the CAP would avoid the generation of approximately 565,000 to 571,000 MT CO_2e, which is equivalent to the following actions (U.S. Environmental Protection Agency 2011).

- Removing more than 120,000 passenger vehicles from the road each year.
- Reducing gasoline consumption by more than 64 million gallons.
- Consuming more than 1.3 million fewer barrels of oil.

Implementing the CAP would reduce the generation of criteria air pollutants in Stockton, including ozone, carbon monoxide, and fine particulates, which would improve public health for the community. Stockton residences and businesses that implement energy efficiency upgrades as a result of this plan would see future savings due to lower future energy bills. Transportation improvements included in this plan would increase mobility and alternative modes of transportation for Stockton residents and visitors. Water improvements included in this plan promote wise use of limited water resources and enhance water quality. Waste reductions included in this plan would reduce the need for landfill space. Other benefits of this plan includes reduction of electricity, natural gas, and gasoline usage which reduces consumer sensitivity to potential increases in future energy prices. Reduction of gasoline consumption also has an additional benefit of reducing dependence on foreign oil supplies.

Benefits are discussed further in Chapter 3 and identified for each measure in Appendix C. As noted above, the competitiveness analysis has also been completed.

Implementing the Plan

Meeting the City's emissions reduction target would require participation of both City government and the community at large. The CAP sets a path for achieving the City's target through a collective initiative that would streamline efforts and ensure new policies are integrated into everyday life.

To facilitate implementation of the CAP, the City has outlined key priorities for three implementation phases starting in 2014 and ending in 2020. Measures to be implemented in each phase are described in Chapter 4.

Phase 1 (2014–2015): Phase 1 would occur between 2014 and 2015. During this phase, the City would develop key ordinances, programs, and policies required to promote the voluntary, incentive-based measures, to establish the planning framework for the performance-based development review process, and to support and implement the local mandatory GHG reduction measures. Measure funding would be established. The City would complete the Specific Plan for the Downtown area to help promote residential development. A key initiative, a public-private partnership to help promote downtown/infill development would be advanced (see further discussion below). A cost-benefit analysis of measures not analyzed in the CAP (i.e., urban forestry, high GWP GHG, and off-road measures) would be completed. In 2015, the City would update the community GHG inventory to monitor emissions trends.

Phase 2 (2016–2017): Phase 2 would occur between 2016 and 2017. The City would conduct a mid-course evaluation of CAP implementation to examine progress made toward meeting the City's reduction target, to examine the effectiveness of the measures in the CAP, and to examine the City's current economic condition to identify if additional or different measures should be adopted and to identify whether the City's reduction target can or should be revised. During Phase 2, the City would continue to implement measures that were begun in Phase 1. The City would also select and encourage implementation of Phase 2 measures.

Phase 3 (2018–2020): Phase 3 would occur between 2018 and 2020. The City would continue to implement and support measures begun in Phases 1 and 2, and encourage implementation of all remaining CAP measures (Phase 3 measures). An analysis of the effectiveness of Phase 1 and 2 measures would be conducted, as well as an update to the community GHG inventory. The City would begin developing a plan for post-2020 actions.

> The City would appoint an Implementation Coordinator as part of the fiscal year 2014/15 budget process to oversee the successful implementation of all selected GHG reduction strategies. The primary function of the Implementation Coordinator would be to create a streamlined approach to manage implementation of the CAP. The Implementation Coordinator would also coordinate periodic community outreach to leverage community involvement, interest, and perspectives.

Successful implementation of the CAP requires the development of a robust planning framework. Specifically, the City would establish a timeline and prioritization scheme for measure implementation. Measure prioritization would be based on a number of factors, including cost effectiveness, GHG reduction efficacy, and general benefits to the community. Financing all measures would require creative, continuing, and committed funding. Implementation of the CAP is resource dependent and will rely on the ability of the City to obtain grants and other local funds.

The citizens and businesses in Stockton are integral to the success of the CAP. Their involvement is essential, considering that several measures depend on the voluntary commitment, creativity, and participation of the community. The City would help to educate stakeholders, such as businesses, business groups, residents, developers, and property owners about the CAP and encourage participation in efforts to reduce GHG emissions. Detailed community outreach and education plans would be developed during Phase 1.

Once the GHG reduction measures have been implemented, regular monitoring is important to ensure reduction measures are functioning as they were originally intended. Early identification of effective strategies and potential issues would enable the City to make informed decisions on future priorities, funding, and scheduling. Moreover, monitoring provides concrete data to document the

City's progress in reducing GHG emissions.

It is anticipated that monitoring, in the form of updated GHG inventories, would be conducted in 2015, 2017, and 2019 and would be tied to the phases describe above. The results of the monitoring would be used to examine GHG reduction progress and would allow for adaptive management of the CAP. The City would develop a detailed protocol for monitoring the effectiveness of emissions reduction measures. The City would also establish guidelines for reporting and documentation, from which, the CIT would make annual reports to the City Council.

While AB 32 focuses on a 2020 target for California, the State has also adopted Executive Order (EO) S-03-05, which articulates a GHG reduction goal for the State to reduce GHG emissions to a level that is 80% below the level in 1990. It is reasonably foreseeable that as California approaches its first milestone in 2020, focus will shift to the 2050 target. Consistent with statewide planning trends, the City would commence planning for the post-2020 period in Phase 3 (2018). By the time Phase 3 begins, the City would have implemented the first two phases of the CAP and would have a better understanding of the effectiveness and efficiency of different reduction strategies and approaches.

A Public/Private Partnership for Downtown Revitalization

On August 28, 2012, the Stockton City Council received a presentation on the work and recommendations of the Urban Land Institute's *Advisory Services Panel Report on Downtown Revitalization*. Much of that report made the case for establishing a public/private partnership, as a means of achieving public goals through private values and investment. Those recommendations, all of which were adopted by the Council, have relevance to the purpose and goals of this Climate Action Plan and, ultimately, to the success of its implementation and results.

Setting the Stage

Unquestionably, if the City of Stockton hopes to have a sustainable source of revenues to provide for basic needs and services, it needs to grow its economy. Infill development, transit-oriented development and adaptive reuse of land and structures, as envisioned in this Climate Action Plan, can be a major contributing part to that new economy. Costs savings over the life-cycle of such land development are discussed in the ULI report. Another contributing factor to the new economy is a streamlined City government that fosters private enterprise that can operate and thrive under the goals and measures of this Climate Action Plan. Another contributing factor is the preparation of an economic development strategy that is in-line with the goals and measures of this Climate Action Plan.

Cultural and structural changes to the conduct of government and business enterprises are called for in both the ULI Advisory Panel Report and this Climate Action Plan. Those changes go to the heart of what will be needed to jump-start and then sustain the City's future growth pattern, reduction in vehicle miles travelled through smarter siting of land uses, adaptive reuse of land and structures, provision of transit options, and a green building program, and other measures. It is not something accomplished overnight and in a vacuum. It is here that a lesson can be taken from the Stockton Marshall Plan, and Stockton's success with the Violence Reduction Initiative and the establishment of Community Response Teams and other such efforts. There was a critical forging of

community stakeholders to plan and strategize a plan of action, and a coalescing of various resources to successfully implement that strategy. The widespread public interest to create an economically vibrant Downtown, one that also fulfills the goals and measures of this Climate Action Plan, warrants a similar stakeholder process.

In these regards, the CAPAC has and will continue to serve the role of planning, encouraging and monitoring the many measures in this Climate Action Plan aimed at greenhouse gas emissions reduction. To provide added focus, the City intends to establish a public/private partnership with key stakeholders regarding revitalization in the Greater Downtown neighborhoods and forging a complementary economic development strategy as envisioned in the ULI Report.

The Structure of a Partnership

The staff report accompanying the ULI Report (August 28, 2012 Stockton City Council agenda) reads in part:

Cities in the Central Valley of California today are facing continued financial difficulty brought by a lagging recession, mortgage foreclosures, federal regulations, state regulations and shifting of financial resources. These changes in the shift in the historic relationships between these three levels of government puts greater strain at the local level. The combined federal and state funding for local government which has seen a dramatic reduction will continue given existing and projected federal and state deficits.

The cumulative effect of these changes has been a loss of revenues, impact of greater imposed regulation and the demand to assume greater responsibility for services. Given the cumulative effect of these changes the ULI Plan states, "cities must seek out new solutions and methods for addressing these needs and the future.'

The Panel is clear that these new solutions are a broad usage of public/private partnerships. In the real estate realm, public-private partnerships have become a common method for achieving public goals while encouraging private capital to invest in a City. 'To be successful the investment and development community needs and wants to be invited into a joint development process.' To successfully achieve the objective of public/private partnerships 'the culture surrounding the relationship of public values and investment and private values and investment needs to be one of mutual respect.'

To this end, the City of Stockton is working towards the establishment of a public/private partnership for revitalization of the Downtown and the preparation of a Stockton Metropolitan Area Economic Development Strategic Plan, both of which have relevance to the infill development goals of the Settlement Agreement and emissions reductions goals of this Climate Action Plan.

The structure of such a partnership, as suggested by the ULI Advisory Panel Report, would include direct partners (those who could be directly involved in the physical revitalization financing and maintenance of the Downtown) and supportive partners (those who bring special expertise and enthusiasm to the revitalization process). The City's role with the partnership would principally be that of a convener and land/infrastructure owner. Members would represent Downtown property owners, private developers/investors, the County of San Joaquin, the Regional Rail Commission, the Regional Transit District, the University of the Pacific, the Downtown Stockton Alliance, the Chamber of Commerce, members from the bank and financial service sector, and other members.

Organization of the Climate Action Plan

The City of Stockton CAP is organized into the following four chapters.

- **Introduction**—Provides an overview of climate change, global warming, and recent state and local legislation relevant to the City's CAP.
- **City of Stockton's GHG Emissions Inventories and Estimates**—Summarizes GHG emissions that were generated by community activities in 2005 and presents an estimate of emissions in 1990 and 2020.
- **Emissions Reduction Measures and Cost/Benefit Analysis**— Summarizes individual GHG reduction measures and presents estimates of their GHG reduction potential, costs, savings, and benefits.
- **Implementation Strategies**—Includes financing options, a timeframe for future plan updates, recommendations for data collection and record keeping, and recommendations for long-term management.

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Chapter 1. Introduction

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Introduction

1.1 Overview of the Climate Action Plan

The San Joaquin Valley had been one of the fastest growing regions in California, prior to the recent economic downturn. A large portion of this growth was attributable to the continuing economic demand for housing development in San Joaquin County due to the lack of affordable housing in the San Francisco Bay Area. Although growth has substantially slowed due to economic conditions, the City of Stockton (City) is still projected to grow by 31,863 inhabitants between 2005 and 2020, or by 10% (U.S. Census 2005; Fehr & Peers 2011). The City therefore faces a demanding challenge to generate the infrastructure required to accommodate future growth, while simultaneously meeting greenhouse gas (GHG) targets established by the state to address global warming.

In response to these challenges, the City adopted their 2035 General Plan, which outlines development goals and stipulations for the reduction of City-wide GHG emissions. As an outgrowth of the approval of the General Plan, the City entered into a Settlement Agreement with the Sierra Club and the Attorney General. This agreement was enacted to ensure the future growth outlined in the 2035 General Plan addresses GHGs in a meaningful and constructive manner. The requirements of the Settlement Agreement are discussed below. The City of Stockton's CAP outlines a framework for reducing GHG emissions associated with community activities.

1.1.1 Settlement Agreement

The Settlement Agreement was signed in October 2008 between the City of Stockton, the Attorney General of California, and the Sierra Club. The Settlement Agreement resolved a lawsuit filed by the Sierra Club and threatened to be joined by the State Attorney General challenging the adequacy of the Environmental Impact Report for the City's 2035 General Plan.

The Settlement Agreement includes the following requirements:

- **Climate Action Plan.** The Agreement requires preparation of a CAP and submittal to the City Council for adoption. The Agreement does not require actual City Council adoption of a CAP. *The CAP is intended to meet this requirement.*
- **Climate Action Plan Advisory Committee (CAPAC).** The Agreement requires the City to establish an advisory committee with specified representatives from different interested parties to assist in preparation of the CAP and other requirements of the Agreement. *The CAPAC has been formed and involved in the development of the Green Building Ordinance, the CAP, and review of other Settlement Agreement requirements.*
- **Climate Action Plan Requirements.** The Settlement Agreement requires the CAP to include the following:
    - An inventory of current emissions and estimates of 1990 and 2020 emission. These are included in the CAP.
    - Identification of specific targets for reductions of current and projected 2020 GHG emissions associated with the City's discretionary land use decisions and internal government

operations. Targets are to be set in accordance with targets in AB 32, other state laws, Air Resources Board regulations and strategies, and any local or regional targets for GHG reductions. *The CAP and identifies a reduction target that is feasible for the City of Stockton, given its current economic condition.*

- Identification of a goal to reduce the growth of vehicle miles travelled (VMT) to be no more than population growth. *The CAP would result in a VMT rate of growth (9%) that would be less than the estimated rate of population growth (11%) between 2005 and 2020.*
- Measures to reduce GHG emissions. *The CAP identifies feasible means to reduce GHG emissions developed from broad list of potential measures that were considered in light of technical, economic, financial, and institutional feasibility*.

- **Green Building Program.** The Settlement Agreement requires preparation of a green building ordinance for both residential and non-residential buildings and submittal to the City Council for adoption. The Settlement Agreement also requires preparation and consideration of ordinance(s) to require reduction of GHG emissions of existing housing units when a permit to make substantial modification is issued, and exploration of a local assessment district or other financing mechanism to fund voluntary actions by owners of residential and non-residential buildings to undertake energy efficiency and renewable energy improvements, consideration of requiring building retrofits as mitigation under the California Environmental Quality Act (CEQA), and periodic review and update of green building requirements to ensure they achieve performance objectives consistent with the best performing 25% of city green building measures in the state. *The City adopted the Green Building Ordinance and the Green-Up Stockton Ordinance in compliance with this part of the Settlement Agreement and the retrofit goals for 2011 to 2013 have been met. The Green Building Ordinance is presently suspended considering potential certain revisions. The City joined the HERO program to provide a property assessment financing vehicle for City residents and approved FigTree financing for non-residential retrofit financing.*
- **Transit Program/Transit Gap Study**. The Settlement Agreement requires preparation of transit program, based on a transit gap study and submittal to the City Council for adoption. The Settlement Agreement does not require actual City Council adoption of a transit program. The transit program needs to include measure to support transit services and operations. The transit program also needs to include requirements for development projects subject to specific plan or master development plan or of statewide, regional or area wide significance to: (1) include street design standards and internal accessibility by all modes of transportation; (2) to provide financial or other support to transit use; and (3) to be of a density to support the feasible operation of transit. *A transit gap study was completed and a transit was program developed; the transit program is included as Appendix D for ultimate consideration by the City Council.*
- **Infill/Downtown Development**. The Settlement Agreement requires the City to develop General Plan policies or programs to support infill/downtown development and submit to the City Council for adoption. The Agreement does not require actual City Council adoption of such policies or programs. The Agreement requires inclusion of the following in the developed policies and programs:
  - Policies and Programs to require at least 4,400 new housing units in the Greater Downtown[9], with 3,000 units approved by 2020. The City is developing General Plan

[9] The Settlement Agreement defines the "Greater Downtown" as "land generally bounded by Harding Way, Charter Way (MLK), Pershing Avenue, and Wilson Way."

amendments separately from the CAP to assure 4,400 housing units by buildout in the Greater Downtown area. The Settlement Agreement was drafted prior to the economic downturn. Growth in the City has slowed dramatically and it is anticipated that only 3,900 new units will be constructed citywide between 2013 and 2020. Thus approving 3,000 units in the Greater Downtown area is highly ambitious but remains a goal of the city.

- Require at least an additional 14,000 of Stockton's new housing units to be located within the City limits as they existed in October 2008. *The existing General Plan already provides for this amount of development and thus no new plans or policies are necessary to meet this portion of the Settlement Agreement.*[10]
- Provide incentives to promote infill development in greater Downtown Stockton and within existing City limits. *The City is developing General Plan amendments separate from the CAP including such incentives for City Council consideration.*

- **Projects Outside the City Limits.** The Agreement requires the City to develop General Plan policies or programs to ensure City-approved or City-authorized development outside the 2008 City limits does not grow out of balance with infill development and submit to the City Council for approval. The Agreement does not require actual City Council adoption of such policies or programs. The Agreement requires inclusion of the following in the developed policies and programs:
  - Limiting of granting entitlements of projects outside the City limits subject to specific plan or master development plan or of statewide, regional or area wide significance until certain criteria are met.
  - Criteria to include transportation, service capacity, water availability, and other performance measures.
  - Levels of infill development, jobs-housing balance, and GHG and VMT reduction goals to be met before new entitlements are granted for such projects.
  - Impact fees or alternative financing to ensure that the performance standards are met.
  - Exploration of an infill mitigation bank and other measures to enhance the financial viability of infill development in the Greater Downtown area.
  - *The City is evaluating General Plan amendments separate from the CAP to provide such criteria and requirements for City Council consideration.*
- **Monitoring.** The Settlement *Agreement requires the City to monitor strategies and measures to ensure they are working to reduce GHG emissions as w*ell as annual VMT monitoring. *The City would track any measures and strategies that are adopted pursuant to the CAP or other Settlement Agreement elements.*

[10] The Settlement Agreement also requires the City to ensure 14,000 units could be built within the City limits, but outside the Greater Downtown Stockton Area (GDSA). At of Fall 2013, 8,256 units had already been entitled in this area since the publication of the General Plan. In addition, the 2010 Stockton Housing Element identifies enough vacant/opportunity sites within the City limits but outside the GDSA to realistically allow for the development of an additional 6,038 units, for a total development capacity in this area of 14,294 units. Therefore, the City has already reached its goal of allowing for the amount of development within the City limits but outside the GDSA, as required by the Settlement Agreement.

- **Early Climate Protection Actions.** While the CAP is being prepared, the Agreement requires the City to identify requirements for evaluation of new development (requiring a MDP or SDP or projects of significance as noted above) in a Climate Impact Study Process including GHG reduction targets, VMT reductions, transit needs, project densities, energy consumption and energy reductions, balancing of growth within downtown and City limits with growth outside the City limits, providing adequate City services, and transportation accessibility by all modes. The Agreement also requires that interim approvals be required to be subject to ordinances and enactments implemented as part of the CAP*. The Climate Impact Study Process has been developed and the City is requiring review of the required elements in subject projects.*

1.1.2 Purpose of the Climate Action Plan

The plan includes an inventory of all GHG emissions that resulting from community activities in 2005 and projected for 2020. Performing an inventory helps the City to identify sectors (e.g., transportation, building energy use) with the highest emissions. The City can then target emissions reductions measures to these sectors.

The CAP identifies an emissions reduction target and measures for reducing future GHG emissions. The City's emissions reduction target is designed to support California's larger effort under AB 32 to reduce statewide emissions. Based on the City's existing and future emissions profile, the plan recommends specific actions the City can take to meet this target.

The CAP provides a roadmap for successfully implementing the emissions reduction measures selected by the City. Implementing the CAP involves multiple moving parts. Residents must be given the tools and knowledge to support new policies and programs. Funding for initiatives, such as building retrofits or incentive programs, must be available. Successes—and failures—need to be identified, monitored, and publicized. This plan outlines several recommendations to address these and other issues so that the City can make informed management decisions.

1.1.3 Development of the Climate Action Plan

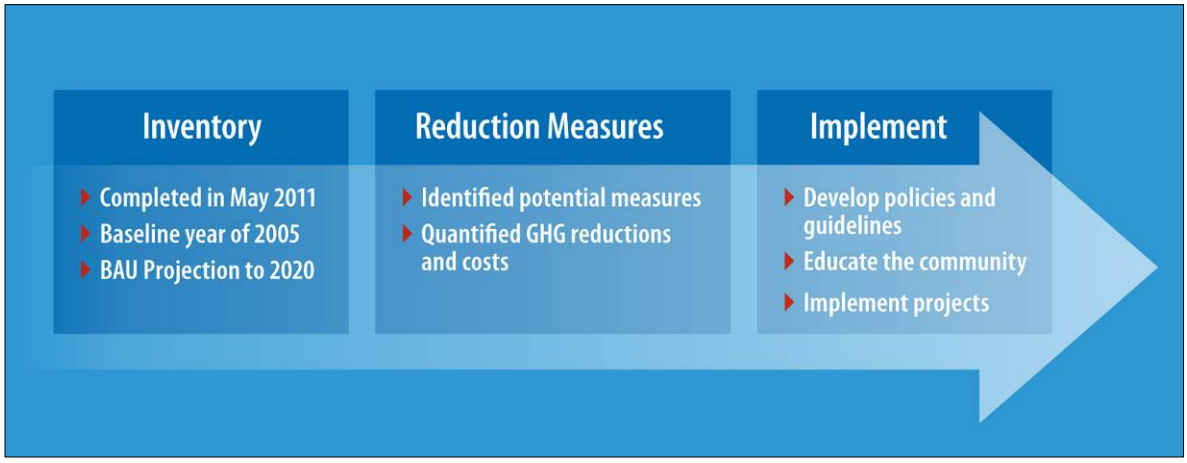
The City established the CAPAC to assist in developing a feasible and robust CAP that considers all aspects of the community and environment. The CAPAC consists of representatives from environmental, non-profit, labor, business, and developer interests. With the assistance of the CAPAC, the City began working on an inventory of GHG emissions from community activities in 2010. The methods, assumptions, and results of the analysis were provided to the CAPAC for public review and comment. The final GHG inventory was completed in 2011.

Simultaneous with the inventory work, the City began researching feasible measures that could be taken to reduce GHG emissions. An extensive list of GHG reduction measures was developed and submitted to the CAPAC for review. Based on feedback provided by the CAPAC, the City selected candidate measures to analyze in greater detail. The amount of GHG emissions that would be avoided in 2020 by each measures were calculated. Costs associated with each measure were also quantified in order to inform final selection of measures for inclusion in the CAP itself.

If the CAP is adopted by the City Council, the reduction measures identified in Chapter 3 would be implemented. Reduction measures usually take the form of policies that are tailored to complement existing programs. Implementation includes identification of responsible parties for each measure, development of funding protocols, scheduling, ongoing monitoring, and progress reporting. Figure

1-1 provides a graphical representation of the City's CAP planning process.

Figure 1-1. The CAP Planning Process



1.2 The Science of Climate Change

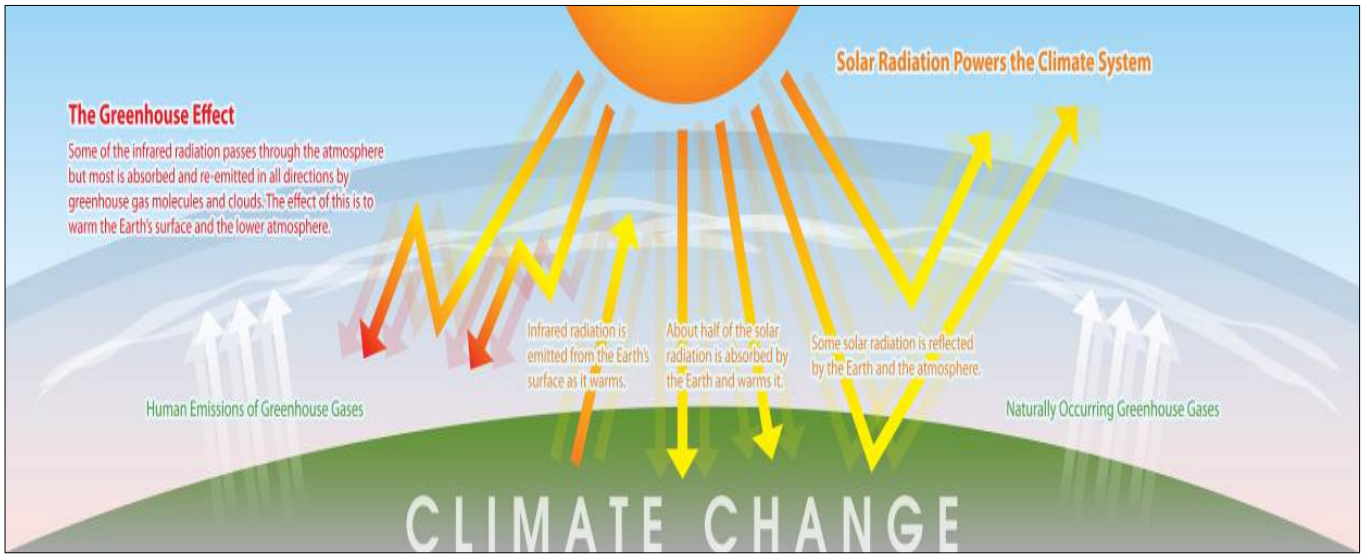
1.2.1 Global Warming

The phenomenon known as the *greenhouse effect* keeps the earth's atmosphere near the surface warm enough for the successful habitation by humans and other forms of life. GHGs present in the earth's lower atmosphere play a critical role in maintaining the earth's temperature as they trap some of the long wave infrared radiation emitted from the earth's surface, which otherwise would have escaped to space (Figure 1-2). The following six GHGs are the primary focus of GHG inventories and reduction planning in state and national protocols: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorinated carbons (PFCs), sulfur hexafluoride (SF_6), and hydrofluorocarbons (HFCs). Each is discussed in detail below (IPCC 2007a).

Increases in fossil fuel combustion and deforestation have exponentially increased concentrations of GHGs in the atmosphere since the industrial revolution. Rising atmospheric concentrations of GHGs in excess of natural levels enhance the greenhouse effect, which contributes to global warming. Warming of the earth's lower atmosphere induces large-scale changes in ocean circulation patterns, precipitation patterns, global ice cover, biological distributions, and other changes to the earth system that are collectively referred to as climate change (IPCC 2007a).

The IPCC has been established by the World Meteorological Organization and United Nations Environment Programme to assess scientific, technical, and socioeconomic information relevant to the understanding of climate change, its potential impacts, and options for adaptation and mitigation. The IPCC estimates that the average global temperature rise between the years 2000 and 2100 could range from 1.1° Celsius, with no increase in GHG emissions above year 2000 levels, to 6.4° C, with substantial increase in GHG emissions (IPCC 2007a). Large increases in global temperatures could have substantial adverse impacts on the natural and human environments on the planet and in California (as described below).

Figure 1-2. The Greenhouse Gas Effect



1.2.2 Principal Greenhouse Gases

The GHGs listed by the IPCC (2007a) (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) are documented in this section in order of abundance in the atmosphere. Water vapor, although the most abundant GHG in the atmosphere, is not included in this list because its concentration is a feedback of changes in the radiative balance in the atmosphere rather than a cause of change[11]. The sources and sinks[12] of each of these gases are discussed in detail below. Generally, GHG emissions are quantified in terms of MT) of carbon dioxide equivalents (CO_2e) emitted per year.

To simplify reporting and analysis, GHGs are commonly defined in terms of a global warming potential (GWP). The IPCC defines the GWP of various GHG emissions on a normalized scale that recasts all GHG emissions in terms of CO_2e. The GWP of CO_2 is, by definition, one (IPCC 2007b).

The GWP values used in this report are based on the IPCC Second Assessment Report (SAR) and United Nations Framework Convention on Climate Change (UNFCCC) reporting guidelines, and are defined in Table 1-1. Although the IPCC Fourth Assessment Report (AR4) presents different GWP estimates, the current inventory standard relies on SAR GWPs to comply with reporting standards and consistency with regional and national inventories (IPCC 2007a).

[11] Water vapor is the most abundant and important greenhouse gas in the atmosphere. However, human activities have only a small direct influence on the amount of atmospheric water vapor. Indirectly, humans have the potential to affect water vapor substantially by changing climate. For example, a warmer atmosphere contains more water vapor. Human activities also influence water vapor through CH4 emissions, because CH4 undergoes chemical destruction in the stratosphere, producing a small amount of water vapor. (IPCC 2007b). Water in the troposphere is a feedback effect, it is not a forcing agent. Artificial changes in water vapor concentrations is too short lived to change the climate. Too much in the air will quickly rain out, not enough and the abundant ocean surface will provide the difference via evaporation. But once the air is warmed by other means, such as man-made GHG emission, water concentrations will rise and stay high, thus providing feedback to atmospheric warming.

[12] A sink removes and stores GHGs in another form. For example, vegetation is a sink because it removes atmospheric CO_2 during respiration and stores the gas as a chemical compound in its tissues.

Table 1-1. Lifetimes, Global Warming Potentials, and Abundances of Several Significant Greenhouse Gases[a]

Gas	Global Warming Potential (100 years)	Lifetime (years)[b]	Atmospheric Abundance
CO_2 (ppm)	1	50–200	379
CH_4 (ppb)	21	9–15	1,774
N_2O (ppb)	310	120	319
HFC-23 (ppt)	11,700	264	18
HFC-134a (ppt)	1,300	14.6	35
HFC-152a (ppt)	140	1.5	3.9
CF_4 (ppt)[c]	6,500	50,000	74
C_2F_6 (ppt)[c]	9,200	10,000	2.9
SF_6 (ppt)	23,900	3,200	5.6

[a] The GWP values presented are based on the IPCC SAR and UNFCCC reporting guidelines (IPCC 1996; UNFCCC 2006). Although the IPCC AR4 presents different GWP estimates, the current inventory standard relies on SAR GWPs to comply with reporting standards and consistency with regional and national inventories.

[b] Defined as the half-life of the gas.

[c] CF4 and C2F6 are PFCs.

ppm = parts per million.

ppb = parts per billion.

ppt = parts per trillion.

Sources: IPCC 1996, 2001, 2007a.

Carbon Dioxide

CO_2 is the most important anthropogenic GHG and accounts for more than 75% of all GHG emissions caused by humans. Its atmospheric lifetime of 50 to 200 years ensures that atmospheric concentrations of CO_2 will remain elevated for decades even after mitigation efforts to reduce GHG concentrations are promulgated (IPCC 2007a). The primary sources of anthropogenic CO_2 in the atmosphere include the burning of fossil fuels (including motor vehicles), gas flaring, cement production, and land use changes (including deforestation).

Methane

CH_4, the main component of natural gas, is the second most abundant GHG and has a GWP of 21 (IPCC 1996). Sources of anthropogenic emissions of CH_4 include growing rice, raising cattle, combusting natural gas, landfill outgassing, and mining coal (National Oceanic and Atmospheric Administration 2005). Atmospheric CH_4 has increased from a pre-industrial concentration of 715 ppb to 1,774 ppb in 2005 (IPCC Change 2007b).

Nitrous Oxide

N_2O is a powerful GHG, with a GWP of 310 (IPCC 1996). Anthropogenic sources of N_2O include agricultural processes (e.g., fertilizer application), nylon production, fuel-fired power plants, nitric acid production, and vehicle emissions. N_2O also is used in rocket engines, racecars, and as an aerosol spray propellant. In the United States (U.S.) more than 70% of N_2O emissions are related to agricultural soil management practices, particularly fertilizer application. N_2O concentrations in the

atmosphere have increased 18% from pre-industrial[13] levels of 270 parts per billion (ppb) to 319 ppb in 2005 (IPCC 2007b).

Hydrofluorocarbons

HFCs are human-made chemicals used in commercial, industrial, and consumer products and have high GWPs (U.S. Environmental Protection Agency 2006). HFCs are generally used as substitutes for ozone-depleting substances (ODS) in automobile air conditioners and refrigerants. As seen in Table 1-1, the most abundant HFCs, in descending order, are HFC-134a (35 parts per trillion [ppt]), HFC-23 (17.5 ppt), and HFC-152a (3.9 ppt) IPCC 1996, 2001, 2007a. Concentrations of HFCs have risen from zero to over 35 ppt since pre-industrial times (IPCC 2007b).

Perfluorocarbons

The most abundant PFCs are CF4 (PFC-14) and C2F6 (PFC-116). These human-made chemicals are emitted largely from aluminum production and semiconductor manufacturing processes. PFCs are extremely stable compounds that are destroyed only by very high-energy ultraviolet rays, which results in the very long lifetimes. The IPCC estimates that global concentrations of CF4 have risen to over 74 ppt (IPCC 2007b).

Sulfur Hexafluoride

SF_6, a man-made chemical, is used as an electrical insulating fluid for power distribution equipment, in the magnesium industry, and in semiconductor manufacturing; and also as a tracer chemical for the study of oceanic and atmospheric processes (U.S. Environmental Protection Agency 2006). In 2005, atmospheric concentrations of SF_6 were 5.6 ppb and steadily increasing in the atmosphere. SF_6 is the most powerful of all GHGs listed in IPCC studies, with a GWP of 23,900 (IPCC 1996, 2007b).

1.2.3 Emissions Sources in the United States and California

Over 97% of U.S. GHG emissions are the result of burning fossil fuels. Of these GHGs, 83% are in the form of CO_2, 10% are CH_4, and 4.5 % are N_2O. Fossil fuels are burned to power vehicles, create electricity, and generate heat. Vehicle emissions are the largest source of CO_2 emissions in California, representing 37% of statewide emissions in 2008. Electrical generation is the second largest source of emissions in California (California Air Resources Board 2010b). On a national level electrical generation is the largest emissions sector and transportation is the second largest sector (U.S. Environmental Protection Agency 2010a). Other sources of GHG emissions generated within the U.S. and California include agriculture, land clearing, the landfilling of waste, refrigerants, and certain industrial processes.

Although many nations, including the U.S., regularly monitor and report GHG emissions, federal legislation to reduce global emissions has not been adopted and is the subject of much debate. The U.S. EPA is presently pursuing regulation of GHGs through the Clean Air Act, following a U.S. Supreme Court ruling clarifying that it has the authority under the Clean Air Act to do so. Many states, including California as a prominent leader, have passed legislation to reduce GHG emissions. California's GHG regulatory framework is discussed further below.

[13] Pre-industrial refers to the period prior to the Industrial Revolution, which is nominally defined as prior to 1750, subsequent to which industrial activity energy use utilizing fossil fuel sources (starting primarily with coal) started to contribute to changed in atmospheric carbon dioxide levels (IPCC 2007b).

1.2.4 Impacts of Climate Change on Central California

Climate change is a complex global phenomenon that also has the potential to alter local climatic patterns and meteorology. Although modeling indicates that climate change will result globally and regionally in sea level rise as well as changes in climate and rainfall, among other effects, there remains uncertainty with regard to characterizing the precise *local* climate characteristics and predicting precisely how various ecological and social systems will react to any changes in the existing climate at the *local* level. Regardless of this uncertainty in precise predictions, it is widely understood that substantial climate change is expected to occur in the future although the precise extent will take further research to define. Consequently, the City will be impacted by changing climatic conditions .

Several recent studies have attempted to characterize future climatic scenarios for the State. While specific estimates and statistics on the severity of changes vary, sources agree that Central California will witness warmer temperatures, increased heat waves, and changes in rainfall patterns. Specifically, the California Energy Commission (CEC) estimates that average annual temperatures will increase by approximately 1.5° Celsius to 6° Celsius by the end of the century. Climatic models also predict that the number of extreme heat days will increase in frequency, magnitude, and duration. Annual precipitation is expected to witness a declining trend, but remain highly variable, suggesting that the Stockton and the San Joaquin Valley will be vulnerable to increased drought (IPCC 2007a; California Natural Resources Agency 2009; California Energy Commission 2009; Lee and Six 2010).

Sea level rise during the next 50 years is expected to increase dramatically over historical rates. The CEC predicts that by 2050, sea level rise, relative to the 2000 level, ranges from 30 centimeters (cm) to 45 cm. Coastal sea level rise could result in saltwater intrusion to inland rivers and associated biological impacts in the Central Valley. Changes in climatic conditions may also lead to broad range of impacts on crops and agriculture, with models predicting an overall loss in yields. Increased risk of wildfires may also dominate future climatic conditions in the Central Valley (IPCC 2007a; California Natural Resources Agency 2009; California Energy Commission 2009; Lee and Six 2010).

Based on the description of impacts to California described above, Stockton will likely be most affected by climatic changes that could comprise the structural integrity of developments and services and the health of residents. Such events could include extreme heat, potential changes in water supply (due to changes in the snowpack and salinity changes in the Delta), changes in soil moisture, and fire hazards, and changes in air quality. Higher temperatures can also result in worsen air quality due to more favorable ozone formation conditions. Changes in snowmelt conditions could result in greater winter river flows, which could change flooding regimes.

1.3 Climate Change Regulation

1.3.1 Federal Regulation

Although there is currently no federal overarching law specifically related to climate change or the reduction of GHGs, regulation under the federal Clean Air Act is forthcoming with the U.S. Environmental Protection Agency (EPA) in a lead role. Foremost among recent developments has been the settlement agreements between the EPA, several states, and nongovernmental

organizations (NGOs) to address GHG emissions from electric generating units and refineries, the U.S. Supreme Court's opinion in *Massachusetts, et al. v. EPA* and the EPA's "Endangerment Finding," "Cause or Contribute Finding," and Mandatory Reporting Rule. Although periodically debated in Congress, no federal legislation concerning greenhouse gas limitations is likely until at least 2016, if then. Figure 1-3 displays a timeline of key state and federal regulatory activity.

Massachusetts, et al. vs. U.S. Environmental Protection Agency (2007)

Twelve U.S. states and cities, including California, in conjunction with several environmental organizations, sued to force EPA to regulate GHGs as a pollutant pursuant to the Clean Air Act (CAA) in *Massachusetts, et al. v. Environmental Protection Agency 549 US 497* (2007). The court ruled that the plaintiffs had standing to sue, GHGs fit within the CAA's definition of a pollutant, and the EPA's reasons for not regulating GHGs were insufficiently grounded in the CAA.

United States Environmental Protection Agency Endangerment Finding (2009)

In its "Endangerment Finding," the EPA Administrator found that GHGs, as described above, in the atmosphere threaten the public health and welfare of current and future generations. The Administrator also found that the combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare. Although the Finding of Endangerment does not place requirements on industry, it is an important step in EPA's process to develop regulation. This measure was a prerequisite to finalizing EPA's proposed GHG emission standards for light-duty vehicles.

United States Environmental Protection Agency Cause or Contribute Finding (2010)

In its "Cause or Contribute Finding" the EPA Administrator found that the combined emissions of these well-mixed GHG from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare (U.S. Environmental Protection Agency 2010a).

United States Environmental Protection Agency Mandatory Reporting Rule for Greenhouse Gas (2009)

Under the Mandatory Report Rule, suppliers of fossil fuels, manufacturers of vehicles and engines, and facilities that emit 25,000 MT CO_2e or more per year of GHGs are required to report annual emissions to the EPA. The mandatory reporting rule does not limit GHG emissions but establishes a standard framework for emissions reporting and tracking of large emitters (U.S. Environmental Protection Agency 2010a).

Update to Corporate Average Fuel Economy Standards (2010/2012)

The current CAFE standards (for model years 2011 to 2016) incorporate stricter fuel economy requirements promulgated by the federal government and the state of California into one uniform standard. Additionally, automakers are required to cut GHG emissions in new vehicles by roughly 25% by 2016 (resulting in fleet average of 35.5 miles per gallon or mpg by 2016). Rulemaking to adopt these new standards was completed in 2010. California agreed to allow automakers who

show compliance with the national program to also be deemed in compliance with state requirements. The federal government issued new standards in 2012 for model years 2017–2025, which will require a fleet average in 2025 of 54.5 mpg.

1.3.2 State Legislation

California has adopted statewide legislation addressing various aspects of climate change and GHG emissions mitigation. Much of this legislation is not directed at citizens or jurisdictions specifically, but rather establishes a broad framework for the state's long-term GHG reduction and climate change adaptation program. The Governor has also issued several executive orders related to the state's evolving climate change policy. Of particular importance to local governments is the direction provided by the AB 32 Scoping Plan, which recommends local governments reduce their GHG emissions by a level consistent with state goals.

Summaries of key policies, legal cases, regulations, and legislation at the federal and state levels that are relevant to the City are provided below. Figure 1-3 displays a timeline of key state and federal regulatory activity.

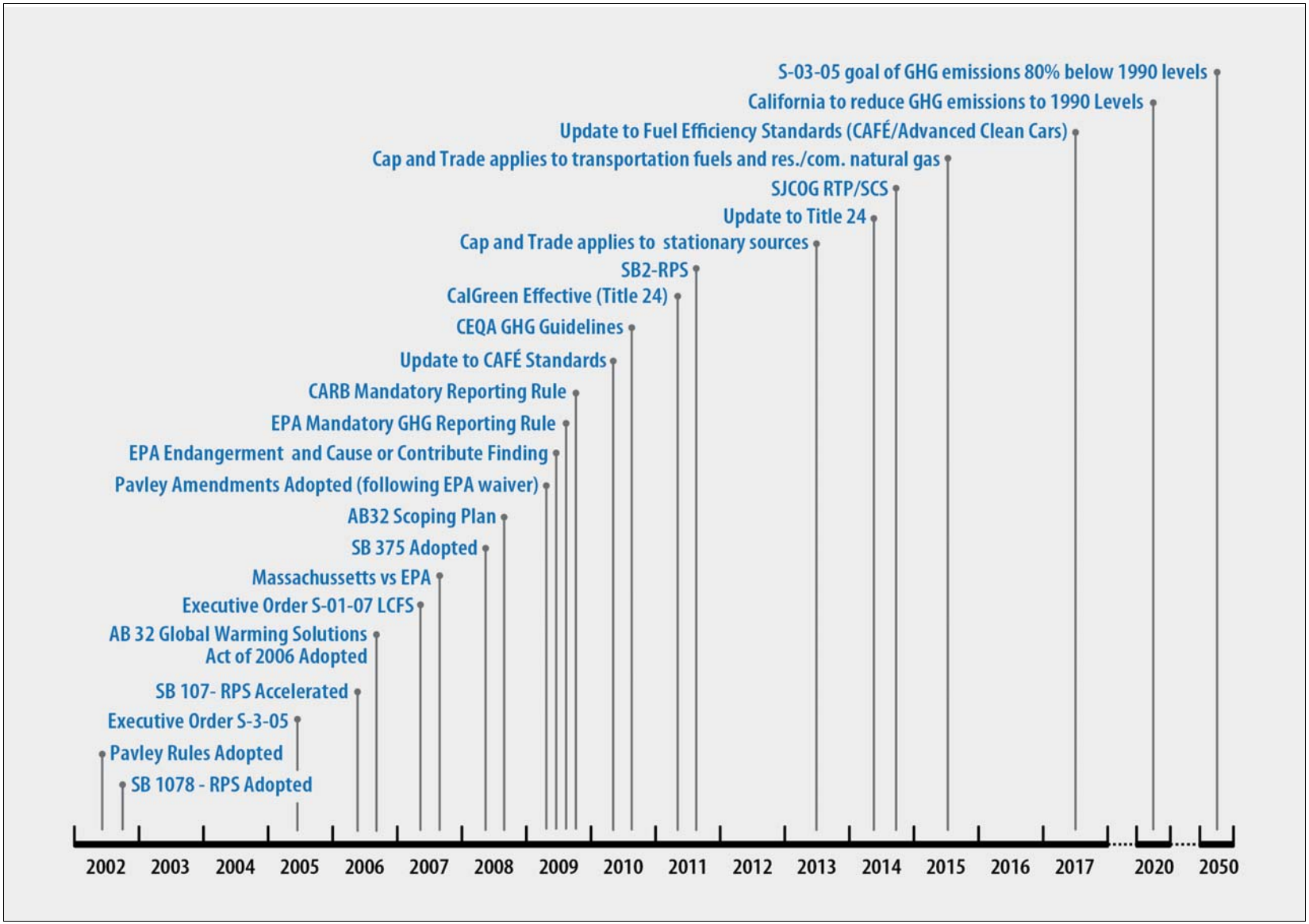
Executive Order S-03-05 (2005)

EO S-03-05 established the following GHG emission reduction targets for California's state agencies:

- By 2010, reduce GHG emissions to 2000 levels.
- By 2020, reduce GHG emissions to 1990 levels.
- By 2050, reduce GHG emissions to 80% below 1990 levels.

Executive orders are binding only on state agencies. Accordingly, EO S-03-05 will guide state agencies' efforts to control and regulate GHG emissions but will have no direct binding effect on local government or private actions. The Secretary of the California Environmental Protection Agency (CalEPA) is required to report to the Governor and state legislature biannually on the impacts of global warming on California, mitigation and adaptation plans, and progress made toward reducing GHG emissions to meet the targets established in this executive order.

Figure 1-3. Key Milestones in Federal and State Climate Legislation



Assembly Bill 1493—Pavley Rules (2002, Amendments 2009, 2012 rule-making)

Known as "Pavley I," AB 1493 standards are the nation's first GHG standards for automobiles. AB 1493 requires the California Air Resources Board (CARB) to adopt vehicle standards that will lower GHG emissions from new light duty autos to the maximum extent feasible beginning in 2009. Additional strengthening of the Pavley standards (referred to previously as "Pavley II", now referred to as the "Advanced Clean Cars" measure) has been proposed for vehicle model years 2017–2025. Together, the two standards are expected to increase average fuel economy to roughly 43 miles per gallon by 2020 and reduce GHG emissions from the transportation sector in California by approximately 14%. In June 2009, the EPA granted California's waiver request enabling the state to enforce its GHG emissions standards for new motor vehicles beginning with the current model year.

EPA and CARB have worked together on a joint rulemaking to establish GHG emissions standards for model-year 2017–2025 passenger vehicles. As noted above, the federal government completed rulemaking 2012 resulting in adoption of new standards that would lead to fleet average of 54.5 mpg in 2025.

Senate Bills 1078/107 and Senate Bill 2 (2011)—Renewables Portfolio Standard

Senate Bills (SB) 1078 and 107, California's Renewables Portfolio Standard (RPS), obligates investor-owned utilities (IOUs), energy service providers (ESPs), and Community Choice Aggregations (CCAs) to procure an additional 1% of retail sales per year from eligible renewable sources until 20% is reached, no later than 2010. The California Public Utilities Commission (CPUC) and CEC are jointly responsible for implementing the program. Senate Bill 2 (2011) set forth a longer range target of procuring 33% of retail sales by 2020.

Assembly Bill 32—California Global Warming Solutions Act (2006)

AB 32 codified the state's GHG emissions target by requiring that the state's global warming emissions be reduced to 1990 levels by 2020. Since being adopted, CARB, CEC, CPUC, and the Building Standards Commission have been developing regulations that will help meet the goals of AB 32 and EO S-03-05. The Scoping Plan for AB 32 identifies specific measures to reduce GHG emissions to 1990 levels by 2020, and requires CARB and other state agencies to develop and enforce regulations and other initiatives for reducing GHGs. Specifically, the Scoping Plan articulates a key role for local governments, recommending they establish GHG reduction goals for both their municipal operations and the community consistent with those of the state.

California Air Resources Board Local Governments Operations Protocol (2008)

On September 25, 2008, CARB adopted the LGOP. The protocol, prepared by CARB, California Climate Action Registry, ICLEI, and the Climate Registry, provides methods and techniques for the preparation of GHG emissions inventories for local government municipal operations. The adopted protocol does not contain recommendations for GHG reductions by local governments (California Air Resources Board 2008).

Executive Order S-01-07—Low Carbon Fuel Standard (2007)

EO S-01-07 essentially mandates: (1) that a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10% by 2020; and (2) that a Low Carbon Fuel Standard (LCFS) for transportation fuels be established in California.[14]

Senate Bill 375—Sustainable Communities Strategy (2008)

SB 375 provides for a new planning process that coordinates land use planning, regional transportation plans, and funding priorities in order to help California meet the GHG reduction goals established in AB 32. SB 375 requires regional transportation plans, developed by metropolitan planning organizations (MPOs) to incorporate a "sustainable communities strategy" (SCS) in their Regional Transportation Plans (RTPs). The goal of the SCS is to reduce regional vehicle miles traveled (VMT) through land use planning and consequent transportation patterns. The regional targets were released by CARB in September 2010. SB 375 also includes provisions for streamlined California Environmental Quality Act (CEQA) review for some infill projects such as transit-oriented development. However, those provisions will not become effective until an SCS is adopted. The regional GHG reduction target for San Joaquin Council of Governments (SJCOG) is an 5% reduction in GHG emissions by 2020. SJCOG is in the process of beginning development of an SCS and is expected to adopt an RTP incorporating an SCS in 2014.

California Energy Efficiency Standards for Residential and Non-residential buildings—Title 24 (2008), Green Building Code (2011), Title 24 Update (2014)

California has adopted aggressive energy efficiency standards for new buildings and has been continually updating them for many years. The latest updated standards were adopted in 2008. Also, in 2008, the California Building Standards Commission adopted the nation's first green building standards, which include standards for many other built environment aspects apart from energy efficiency. The California Green Building Standards Code (proposed Part 11, Title 24) was adopted as part of the California Building Standards Code (24 California Code of Regulations [CCR]). Part 11 establishes voluntary standards that became mandatory in the 2010 edition of the code, including planning and design for sustainable site development, energy efficiency (in excess of the California Energy Code requirements), water conservation, material conservation, and internal air contaminants. The voluntary standards took effect on January 1, 2011. The next update of the Title 24 energy efficiency standards was adopted in 2012 and will take effect in 2014.

California Air Resources Board Greenhouse Gas Mandatory Reporting Rule Title 17 (2009)

In December of 2007, CARB approved a rule requiring mandatory reporting of GHG emissions from certain sources, pursuant to AB 32. Facilities subject to the mandatory reporting rule must report their emissions from the calendar year 2009 and have those emissions verified by a third party in

[14] CARB approved the LCFS on April 23, 2009 and the regulation became effective on January 12, 2010 (California Air Resources Board 2011). The U.S. District Court for the Eastern District of California ruled in December 2011 that the LCFS violates the Commerce Clause of the U.S. Constitution. CARB appealed this ruling in 2012 and on September 18, 2013, a 9th U.S. Circuit Court of Appeals panel upheld the LCFS, ruling that the program does not violate the Commerce Clause and remanded the case to the Eastern District.

2010. In general the rule applies to facilities emitting more than 25,000 MT CO_2e in any given calendar year or electricity generating facilities with a nameplate generating capacity greater than 1 megawatt (MW) and/or emitting more than 25,000 MT CO_2e per year. Additional requirements also apply to cement plants and entities that buy and sell electricity in the state.

State CEQA Guidelines (2010)

The State CEQA Guidelines require lead agencies to describe, calculate, or estimate the amount of GHG emissions that would result from a project. Moreover, the State CEQA Guidelines emphasize the necessity to determine potential climate change effects of the project and propose mitigation as necessary. The State CEQA Guidelines confirm the discretion of lead agencies to determine appropriate significance thresholds, but require the preparation of an environmental impact report (EIR) if "there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with adopted regulations or requirements" (Section 15064.4).

The guidelines were updated in 2010 to address GHG emissions. State CEQA Guidelines section 15126.4 includes considerations for lead agencies related to feasible mitigation measures to reduce GHG emissions, which may include, among others, measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision; implementation of project features, project design, or other measures which are incorporated into the project to substantially reduce energy consumption or GHG emissions; offsite measures, including offsets that are not otherwise required, to mitigate a project's emissions; and, measures that sequester carbon or carbon-equivalent emissions.

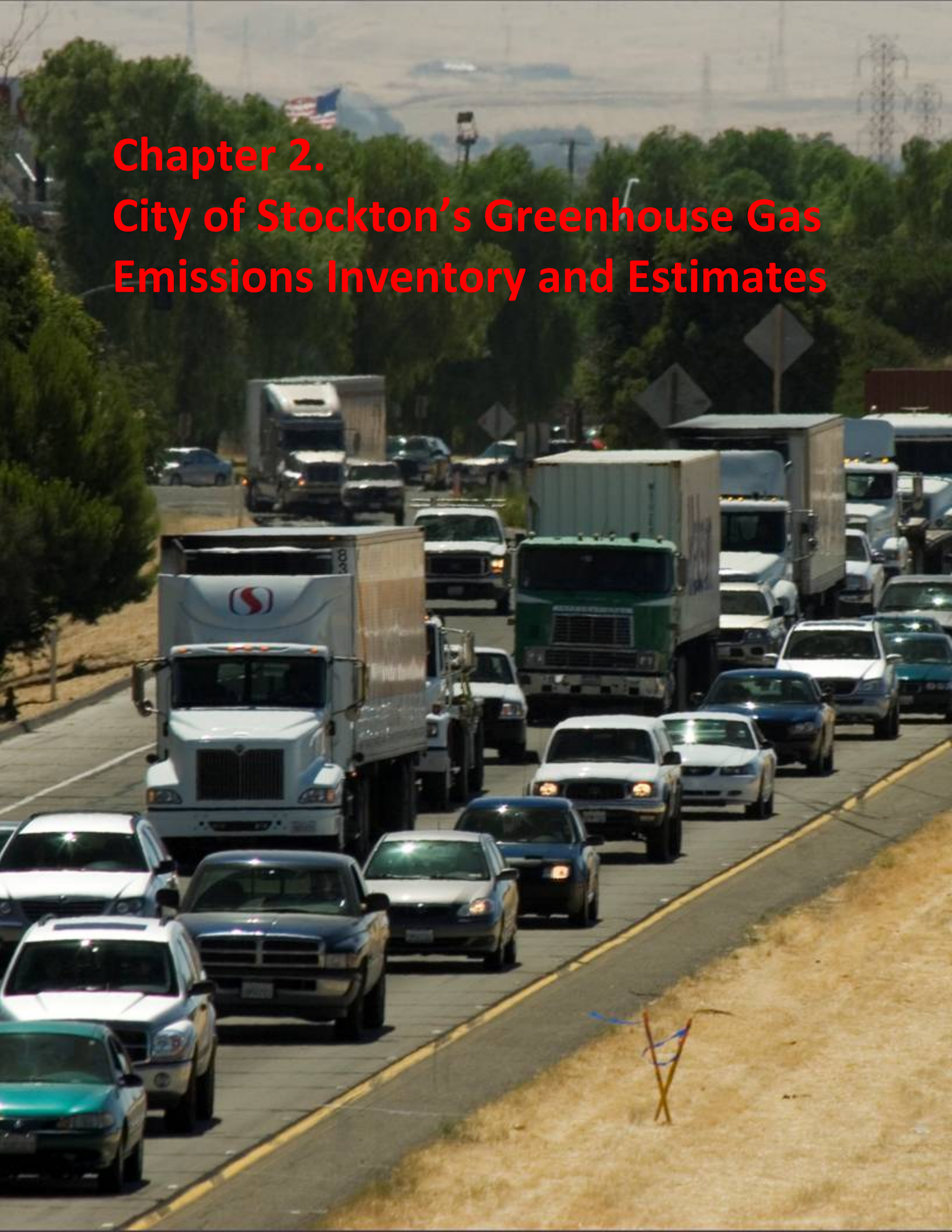
Greenhouse Gas Cap-and-Trade Program (2013)

On October 20, 2011, CARB adopted the final cap-and-trade program for California. The California cap-and-trade program has created create a market-based system with an overall emissions limit for affected sectors. The program is proposed to regulate more than 85% of California's emissions and will stagger compliance requirements according to the following schedule: (1) electricity generation and large industrial sources (2013); (2) fuel combustion and transportation (2015). The first auction occurred in late 2012 with the first compliance year in 2013.

1.3.3 Local Governments

The AB 32 Scoping Plan establishes a framework for achieving statewide GHG reductions required by AB 32. Specifically, the Scoping Plan describes a list of measures that the state will undertake, and the anticipated GHG reductions associated by these measures, by 2020. Because the State does not have jurisdictional control over all of the activities that produce GHG emissions in California, the AB 32 Scoping Plan articulates a unique role for local governments in achieving the state's GHG reduction goals. The AB 32 Scoping Plan recommends that local governments reduce GHG emissions from both their municipal operations and community at large. Many jurisdictions across California have completed a CAP. In San Joaquin County, Tracy is the only jurisdiction that has currently adopted a plan (Tracy Sustainability Action Plan, 2011) to reduce GHG emissions but San Joaquin County has been developing their CAP and Lodi is planning to start development shortly.

Chapter 2.
City of Stockton's Greenhouse Gas Emissions Inventory and Estimates



Chapter 2
City of Stockton's Greenhouse Gas Emissions Inventory and Estimates

2.1 Overview of Analysis Procedures

To support development of the CAP, the City prepared a 2005 community GHG inventory and 1990 and 2020 emissions estimate in 2011. Consistent with state and federal guidance (e.g., CARB, IPCC), the community inventory includes GHG emissions occurring in association with the land uses within the City's jurisdictional boundary. The inventory also includes emissions that occur outside the jurisdictional boundary, but only to the extent that such emissions are due to land uses within the City. The 2005 community GHG inventory represents the *baseline* inventory, or *existing conditions*.

The 2020 emissions forecast is a prediction of community emissions that would occur in 2020, absent any federal, state, or local reduction measures designed to reduce GHG emissions. This approach is consistent with CARB's definition of the Statewide 2020 emissions forecast, as outlined in the AB 32 Scoping Plan (California Air Resources Board 2008). The 2020 emissions forecast is therefore an estimate of future emissions based on existing energy and carbon factors. Expected growth in City population, housing, and employment are used to project baseline emissions to 2020. The analysis is the *business as usual* (BAU) forecast.

Similar to the 2020 BAU forecast, the 1990 emissions projection represents an estimate of community emissions in 1990. This analysis is called the *emissions backcast*, and is based on 1990 socioeconomic factors in comparison to 2005 factors.

As is the standard practice, the GHG inventories are presented in MT CO_2e in all Stockton CAP figures and tables, unless otherwise noted. Presenting inventories in CO_2e equivalence allows one to characterize the complex mixture of GHG as a single unit taking into account that each gas has a different GWP.

2.1.1 Emissions Sectors Included in the Analysis

The baseline inventory and BAU forecast analyzed GHG emissions from the following sectors.

- **On-Road Transportation:** Fuel consumption for on-road vehicles due to the land uses in the City.
- **Building Energy (Residential, Commercial, and Industrial):** Natural gas and electricity consumption for the residential, commercial, and industrial sectors.
- **Solid Waste Management:** Methane emissions from waste generated by the community and deposited in landfills.
- **Off-Road Equipment:** Fuel consumption for off-road vehicles and equipment in the City.
- **High GWP GHGs:** Fugitive emissions of HFCs and CFCs from refrigeration and air conditioning units, as well as SF_6 from the transmission of electricity to the City.
- **Wastewater Treatment:** Process emissions from wastewater treatment, as well as stationary

emissions from stationary fuel combustion at the wastewater treatment facility.

- **Water Importation:** Electricity consumption associated with water importation.
- **Agriculture**: N_2O emissions from fertilizer application from farm operations.

The GHG Inventory does not include an analysis of GHG emissions from land use change and carbon sequestration. At the time of the original inventory, standard methodology and emission factors for quantifying these emissions had not been developed by the CARB or SJVAPCD. Likewise, a detailed inventory of existing and future vegetation within the City was not available. Emissions from stationary sources (e.g., generators) were also not included as these are regulated by the CARB and the SJVAPCD. In addition, Stockton has no large stationary sources (e.g., cement plants); GHG emissions and potential mitigation would therefore be negligible compared to other inventory sectors.

2.1.2 Quantification Protocols

The City calculated GHG emissions under existing conditions using activity data specific to the City's operations. The primary protocols consulted for the analysis are: [15].

- Local Governments Operations Protocol (LGOP) for the quantification and reporting of greenhouse gas emissions inventories (California Air Resources Board 2010c);
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006); and
- 2009 General Reporting Protocol (Version 3.1) for reporting entity-wide GHG emissions (California Climate Action Registry 2009).

To estimate emissions generated in 2020, baseline emissions were multiplied by the expected growth in population, housing, or employment. The complete inventory report, which includes additional details on quantification methods, is provided in Appendix B.

2.2 Summary of Emissions

2.2.1 City of Stockton 2005 Emissions Inventory

In 2005, the City produced 2,360,932 MT CO_2e. This is equivalent to the annual GHG emissions generated by approximately 462,928 passenger vehicles (U.S. Environmental Protection Agency 2011).

The largest source of emissions within the City is on-road transportation, which represented 48% of total community emissions in 2005. Transportation emissions are often the largest source of emissions in community inventories due to the sheer number of vehicles traveling throughout a jurisdiction. Building energy emissions are the second largest source of emissions, accounting for 33% of total community emissions. This sector includes emissions associated with natural gas combustion and electricity consumption in residential, non-residential, and industrial buildings in Stockton. The third largest source is off-road equipment, with a contribution of 8% of the total 2005

[15] The inventory was completed in 2010 prior to the issuance of the 2012 U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions (ICLEI, 2012). However, the methods used for the inventory are consistent with the methods used in the 2012 protocol.

emissions. The remaining sources in order of greatest contributions are high GWP GHGs (4%), wastewater treatment (4%), solid waste management (3%), water importation (0.4%), and agriculture (0.04%).

2.2.2 City of Stockton 1990 Backcast and 2020 Business as Usual Forecast

By 2020, community-wide emissions within the City are expected to reach 2,672,519 MT CO_2e, which is an increase of approximately 13% more than 2005 levels. The increase will occur primarily because of increases in VMT, building energy and water use, and wastewater generation. As population and employment in Stockton grow, transportation activity and energy consumption increase. Likewise, water consumption and wastewater generation will increase due to higher demand. On-road transportation (46%), building energy (34%), and off-road equipment (8%) are still expected to be the largest emissions sources within the City in 2020.

The 2020 forecast is based on the City's current estimate of expected growth by 2020 which was adjusted downward from the General Plan's estimate of growth to reflect the economic downtown which has affected Stockton severely since 2007. Current growth in housing and population since 2007 has been very limited compared to the expectations at the time of development of the General Plan. Although the City's forecast for 2020 includes current assumptions about growth that have factored in the economic downturn, it is possible that the 2020 forecast may still be somewhat optimistic. If population, employment and housing growth is less than that estimated at present, then the estimate of 2020 GHG emissions presented below may overestimate likely emissions levels in 2020.

Table 2-1 summarizes GHG emissions for each inventory sector in 1990, 2005, and 2020; Table 2-2 compares the change in emissions between the years. Figures 2-1 and 2-2 provide a graphical representation of the values presented in Tables 2-1 and 2-2. Additional detail on inventory assumptions and calculations are presented in Appendix B.

Table 2-1. City of Stockton Community GHG Inventories: 1990 Emissions Backcast, 2005 Baseline, and 2020 BAU Forecast (MT CO_2e)[a, b]

	1990		2005		2020	
Emissions Sector	MT CO_2	% of Total	MT CO_2	% of Total	MT CO_2	% of Total
Agriculture	928	0.05%	928	0.04%	928	0.03%
Building Energy	560,993	31.3%	776,186	32.9%	911,272	34.1%
High Global Warming GHG	76,444	4.3%	100,931	4.3%	112,478	4.2%
Off-Road Equipment	154,233	8.6%	176,431	7.5%	213,300	8.0%
On-Road Transportation	836,037	46.7%	1,132,265	48.0%	1,232,663	46.1%
Solid Waste Management [c]	79,939	4.5%	65,720	2.8%	78,347	2.9%
Wastewater Treatment	75,569	4.2%	99,777	4.2%	111,191	4.2%
Water Importation	6,977	0.4%	8,694	0.4%	12,340	0.5%
Total Emissions	1,791,120	100%	2,360,932	100%	2,672,519	100%

[a] For more information, see Appendix B.

[b] As disused with all emissions analyses, the calculations presented above contain a certain amount of uncertainty. Quantitative error analyses are complicated, require detailed statistical equations, and are outside the scope of the consultant's work. The EPA estimates an error range of -1% to 6% for the 2009 national inventory. Given that the City's 2005 inventory employed similar methods and analysis factors, a similar level of error can be expected, yielding an emissions range of 2,337,323 MT CO_2e to 2,502,588 MT CO_2e. Uncertainty associated with the 1990 backcast and 2020 forecast are likely higher due to the assumptions associated with the City's socioeconomic data.

[c] Note that solid waste management emissions decline between 1990 and 2005 and then increase between 2005 and 2020. This is because the landfill profile between 1990 and 2020 changes. More specifically, the number and efficiency of methane capture systems is highest in 2005, which results in the dip in emissions, compared to 1990. Because the 2020 forecast does not include any future methane control improvements, the amount of waste generation increased the 2020 emissions.

Table 2-2. Percent Change in GHG Emissions by Inventory Year [a]

Sector	1990 Backcast to 2005 Baseline	2005 Baseline to 2020 BAU Forecast
Agriculture [b]	0.00%	0.00%
Building Energy	38.36%	17.40%
High Global Warming GHG	32.03%	11.44%
Off-Road Equipment	14.39%	20.90%
On-Road Transportation	35.43%	8.87%
Solid Waste Management	-17.79%	19.21%
Wastewater Treatment	32.03%	11.44%
Water Importation	24.61%	41.94%
Total Emissions	31.81%	13.20%

[a] For more information, please refer to Appendix B.

[b] Crop acreages in 1990 and 2020 were unavailable. Consequently, emissions of agriculture in 1990 and 2020 were assumed to equal emissions in 2005. Future agricultural areas within the City may be condensed as a result of increasing population and urbanization. Assuming constant crop acreage between 2005 and 2020 therefore represents the most conservative approach for estimating emissions from agriculture, given the availability of existing data and relative importance of the sector.

Figure 2-1. City of Stockton Community GHG Inventories: 1990 Emissions Backcast, 2005 Baseline, and 2020 BAU Forecast (MT CO_2e)

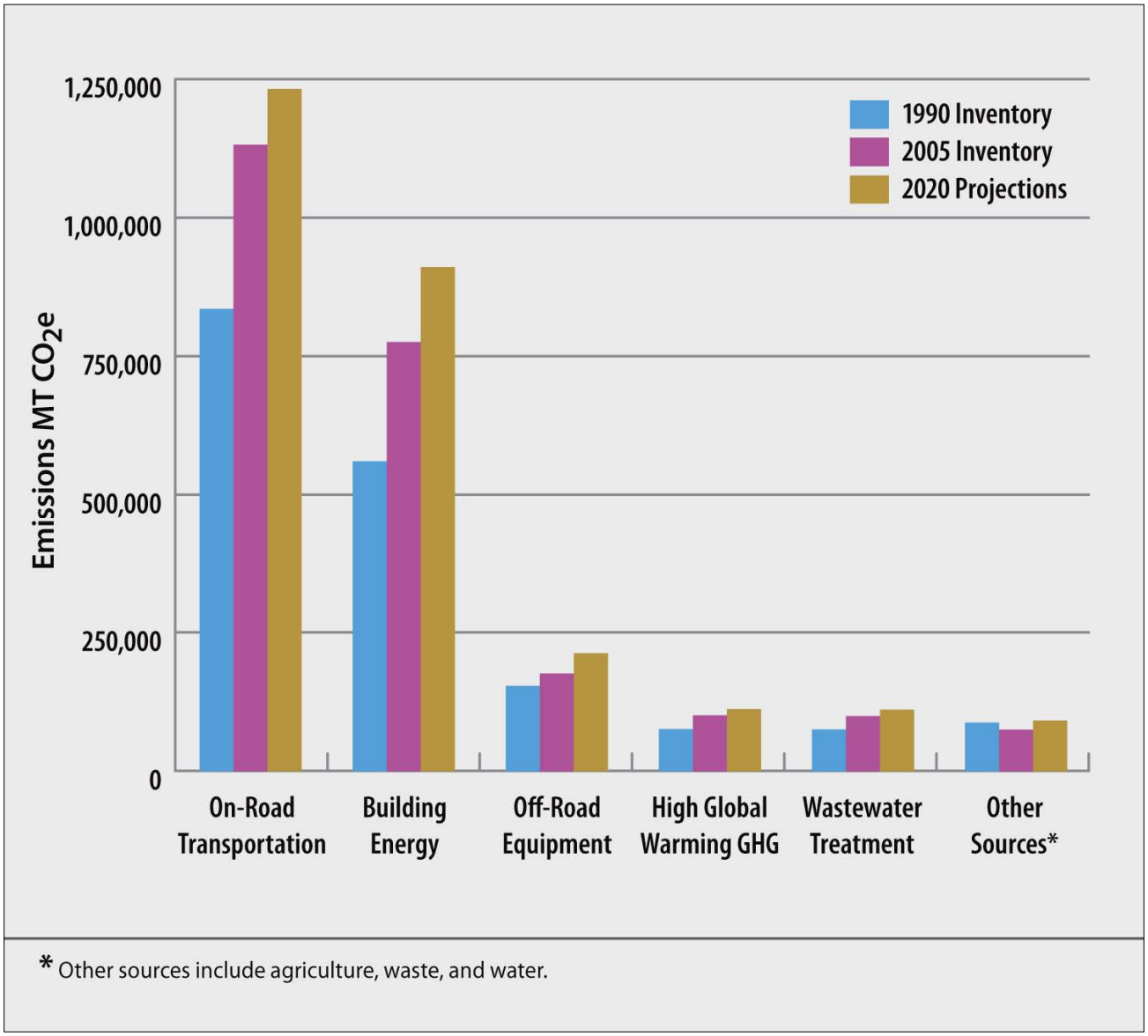
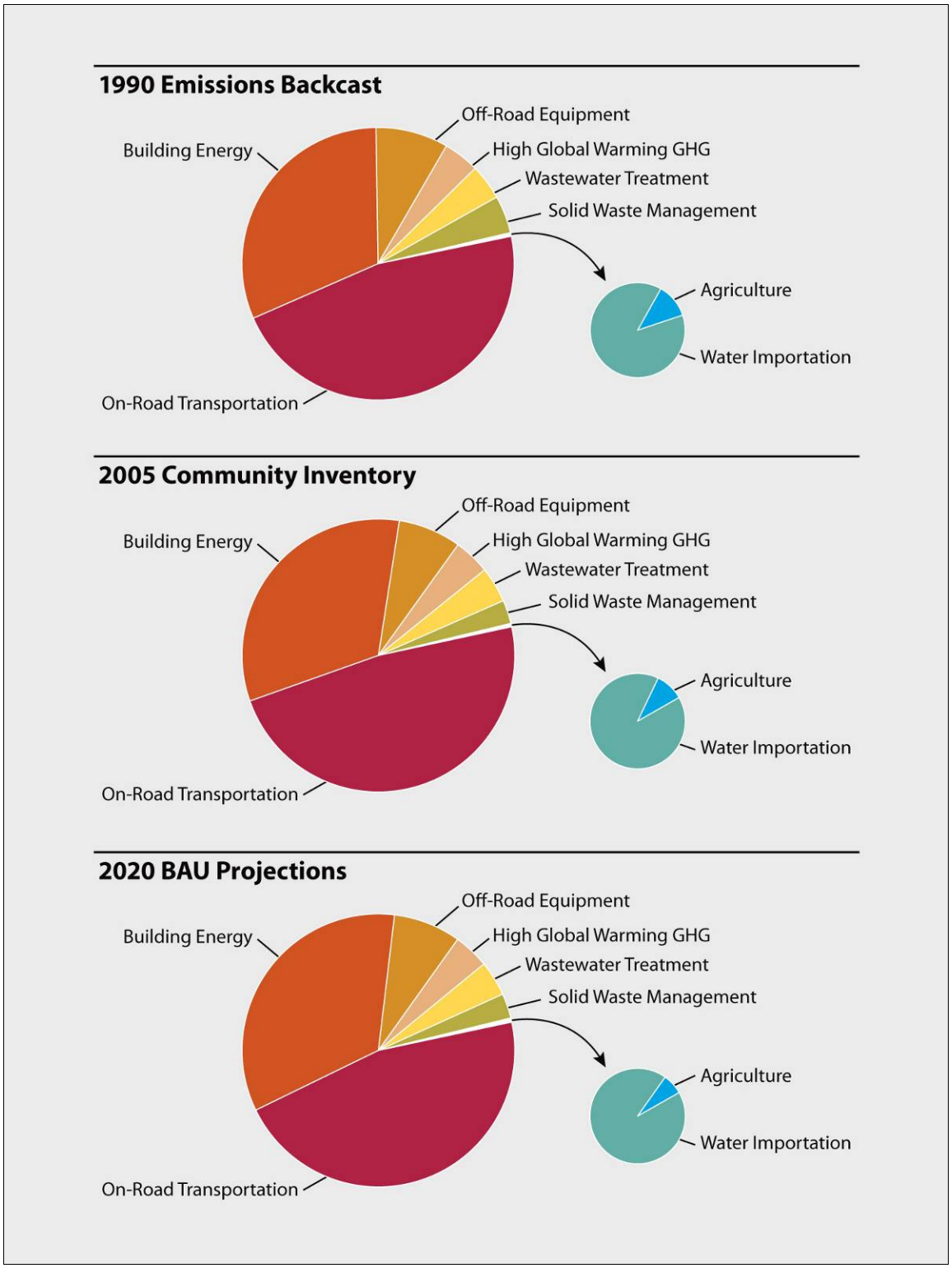


Figure 2-2. Detailed View—City of Stockton Community GHG Inventories: 1990 Emissions Backcast, 2005 Baseline, and 2020 BAU Forecast (MT CO_2e)



2.3 City of Stockton's Emissions in Context

The challenge of GHG emissions is a cumulative and global challenge. The cumulative emissions of the entire world are the cause of rising atmospheric levels of GHGs. As such, the contributions of all sources are important to any effective effort at reducing GHG emissions. The absolute percentage of emissions from any one jurisdiction does not mean its emissions are not cumulatively considerable. Global GHG emissions are literally the result of the actions of billions of individuals across the planet. Each on their own will not cause climate change, but cumulatively they become meaningful and consequential.

In 2005, the City's community emissions represented approximately 0.5% of the 2005 statewide GHG emissions inventory. Table 2-3 compares baseline emissions in Stockton to statewide GHG emissions inventories for 2005 and available local GHG inventories for years near 2005.

Table 2-3. Stockton 2005 GHG Emissions Relative to State and Other Local GHG Inventories (MT CO_2e)

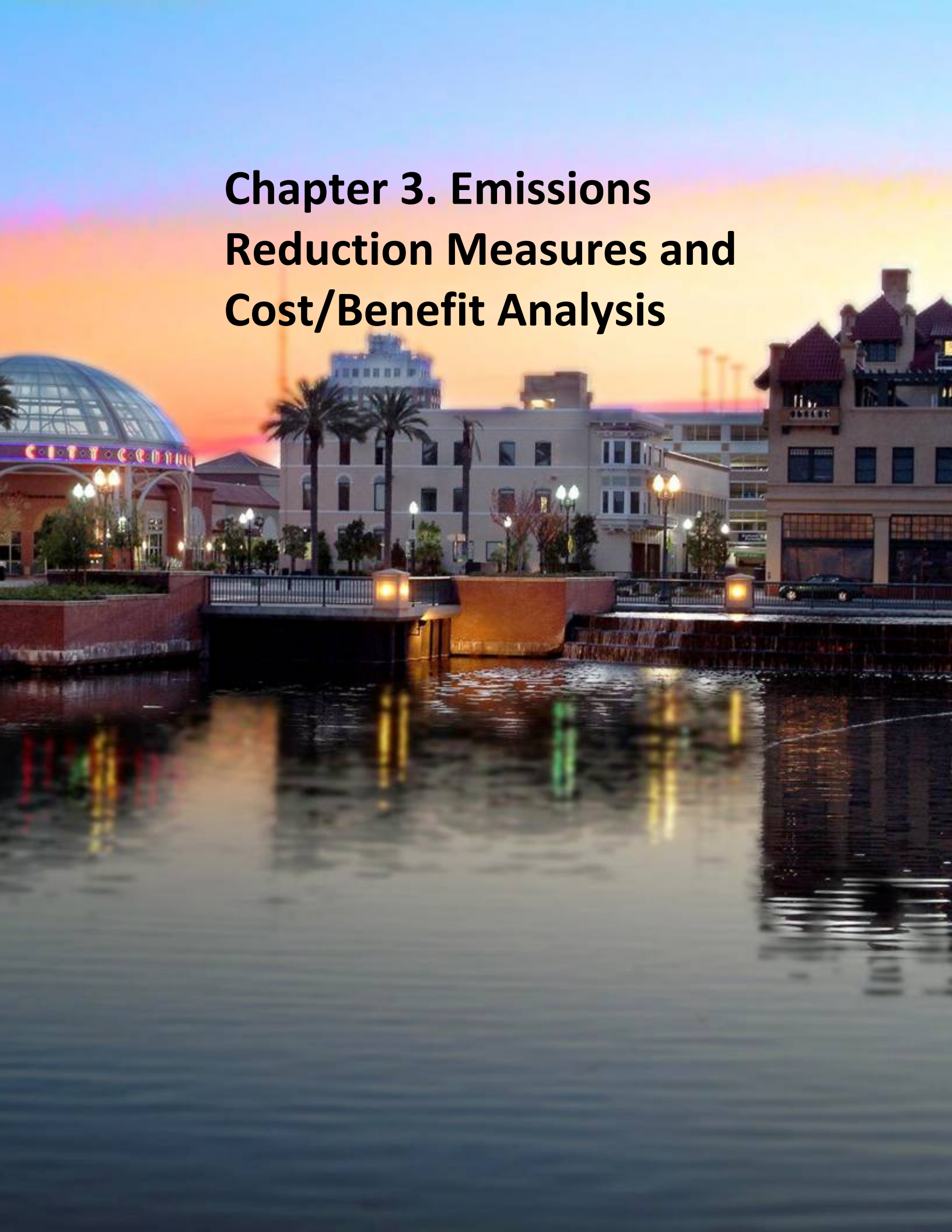
GHG Emissions	MT CO_2e
City of Stockton (2005)	2,360,932
California (2005)	476,730,000
City of Tracy (2006)	1,350,321
San Joaquin County (2007)	4,832,020
City of Sacramento (2005)	4,553,051
City of Livermore (2005)	419,685

Sources: California Air Resources Board 2010c; City of Tracy 2011; San Joaquin County 2009; ICF Jones & Stokes 2009; ICF, 2010, unpublished data.

Note: The San Joaquin County 2007 GHG inventory appears to include through traffic on freeways and roadways through the unincorporated county; if so, it is not readily comparable to the Stockton inventory which uses and origin-destination method for estimating transportation emissions that excludes through traffic. The City of Sacramento 2005 inventory also did not use an origin-destination method for transportation emissions analysis and may also overstate emissions.

While the information presented in Table 2-3 is useful for analyzing Stockton's emissions within a statewide context, it is only presented for illustrative purposes only. Different inventory methods and data availability result in variability between each inventory. For example, transportation emissions that originate or terminate in the location are often included in that location's inventory (as was done for the City of Stockton), but sometimes, jurisdictions only the transportation emissions take place within the boundaries of a location are assigned to the inventory. Thus, comparing different emissions inventories includes some level of uncertainty. However, the state inventory generally includes most of the similar sectors included in the Stockton inventory, so a rough comparison is appropriate. Caution is best applied when comparing one city or county inventory to another; one must examine the actual methods used before asserting any validity in comparing different cities and counties.

Chapter 3. Emissions Reduction Measures and Cost/Benefit Analysis



Chapter 3
Emissions Reduction Measures and Cost/Benefit Analysis

3.1 Introduction

The City's CAP sets forth a framework for reducing 2020 community emissions that is consistent with the AB 32. Successful implementation of the CAP would require commitment and action throughout the community. Based on the City's GHG emissions inventories (see Chapter 2), the CAP targets the following eight sectors.


Building Energy Use


Transportation and Land Use


Waste Generation


Water Consumption


Wastewater Treatment


Urban Forestry


High Global Warming Potential GHGs


Off-Road Vehicles

In addition to the City's eight reduction sectors, carbon offsets may be considered as one means by which new development may meet the reduction performance standard included in the CAP.

The following sections identify the City's emissions reduction target, describe how the reduction measures were developed, summarize emissions reductions, present the cost/benefit analysis results, and summarize each of the measures. Appendix C contains detailed information for each individual measure, including the assumptions and methodologies used to quantify emissions reductions and to complete the cost/benefit analysis.

3.2 Emissions Reduction Goal

CARB, which is the lead agency empowered to implement AB 32, adopted the AB 32 Scoping Plan in December 2008, which is a policy document outlining the state's approach to meeting the AB 32 GHG reduction targets. In the Scoping Plan, CARB recommended, but did not require, an emissions reduction goal for local governments of 15% below "current"[16] emissions to be achieved by 2020 (California Air Resources Board 2008). Based on this recommendation, the City identified an interim

[16] "Current" as it pertains to the AB 32 Scoping Plan is commonly understood as sometime between 2005 and 2008.

GHG emissions reduction goal for the purposes of initial CAP development of 15% below 2005 levels.

During development of the CAP, the City evaluated the effect of the state's reduction measures and evaluated a wide range of potential local GHG reduction measures to examine the feasibility, cost, and benefits of potentially meeting the interim reduction target. Although technically feasible to meet the interim reduction target, it is the City's judgment that meeting the target would require measures that are infeasible under current conditions in Stockton, and which would result in short- and near-term financial impacts that could affect economic recovery in Stockton. While some of the initially identified reduction strategies could result in long-term economic benefits, particularly for measures regarding energy efficiency, the City finds that the current economic climate limits the extent of the measures that the City can propose at this time.

At the time of development of the AB 32 Scoping Plan in 2008, the state's GHG inventory had only been completed from 1990 through 2004 with a forecast to 2020. If one interpolates between the 2004 and 2020 emission estimates at the time of the AB 32 Scoping Plan, you find that CARB's recommendation of 15% below "current" levels roughly corresponds to 15% below 2007 levels. Subsequent to the AB 32 Scoping Plan, CARB completed state inventories for 2005 to 2010. Using this new data, statewide 1990 emissions (433.29 million MT CO_2e) are equivalent to approximately 10%[17] below 2005 levels (482.09 million MT CO_2e).[18] In light of this updated data, and the evaluation of feasibility described above, the City now proposes approximately 10%[19] below 2005 levels as its GHG reduction goal, which is consistent with the statewide reductions needed, relevant to the statewide 2005 levels, to meet the overall AB 32 reduction target.

The measures described in this Plan would, if fully implemented, meet the identified reduction target. To achieve this target, the City would need to limit future emissions to approximately 2,122,000 MT CO_2e. Based on the 2020 BAU forecast, reductions needed to achieve this goal equate to approximately 551,000 MT CO_2e.

3.3 Developing the CAP Framework

The City's CAP includes a variety of voluntary, performance-based, and mandatory strategies that would affect emissions in both the existing built environment, as well as emissions from new development expected to occur by the year 2020. The CAP builds on current statewide initiatives (such as the RPS) and prior local initiatives (such as the City's Green Building Ordinance). Strategies for existing residential and non-residential buildings to voluntarily improve energy efficiency, save money, and reduce GHG emissions are identified. A framework for new private developments to contribute to GHG emissions reduction through a flexible performance-based Development Review Process (DRP) is also provided.

3.3.1 Reduction Measure Selection Process

The City's CAP includes a variety of reduction measures that are proposed in addition to State legislation and policy. The reduction measures were selected following a comprehensive review of

[17] Actually 10.12%.

[18] See Calculations in Appendix E.

[19] Actually 10.12%.

potential strategies that could be feasibility taken to reduce GHG emissions from the City's community activities. The list of potential strategies drew from federal and state level resources, recommendations from the Attorney General, as well as existing CAPs throughout California.

The City circulated a broad array of reduction measures amongst the CAPAC and public in 2010. The CAPAC provided input on adequacy of emissions sectors affected by reduction measures, feasibility of implementation, and stringency of individual measures. Based on CAPAC and public feedback, the City added to and refined the candidate measures and produced a prioritized list for inclusion in the CAP.

3.3.2 Quantification of Emissions Reductions and Costs

The quantification of GHG reductions was based on guidance provided by the California Air Pollution Control Officers Association (CAPCOA) and professional experience obtained from preparing CAPs for other jurisdictions in California. The majority of calculations were performed using standard factors and references, rather than performing a specific analysis of individual technologies. To the extent feasible, information specific to the City, such as electricity and natural gas consumption, was used in the calculations. See Appendix C for a detailed discussion of the assumptions and methodologies used to quantify emissions reductions for each individual measure.

For GHG reduction measures in the energy, transport, waste, wastewater, and water sectors, costs and savings directly associated with the implementation of each measure were estimated for the City, as well as for private residents and businesses.[20] These costs and savings were estimated using information specific to the City of Stockton—when available—or for similar cities in the region, State of California, or United States, prioritized in that order. The majority of data was from public sources, including CPUC, CEC, EPA, and U.S. Department of Energy (DOE), as well as from the City's utility, Pacific Gas and Electric (PG&E).

Estimated costs include initial capital costs (e.g., the upfront purchase and installation of a technology), operations and maintenance costs, operational savings (including reduced costs associated with electricity, natural gas, and fuel usage,[21] as well as the reduced need for maintenance) and the City's implementation costs. Where possible, a simple payback period[22] was estimated, representing the number of years before the initial investment is repaid. Also, to allow for better side-by-side comparison of measures, cost-per-ton values for emissions reductions in 2020 were calculated in annualized dollars, when feasible.[23] Capital costs, operation and maintenance costs, and City implementation costs are presented in Chapter 4, which also breaks down costs by whether they would be incurred by the City or by the private sector (or non-City entities such as transit districts, schools, etc.). Appendix C contains a detailed discussion of the assumptions and methodologies used to estimate costs for individual measures.

[20] While costs and savings were estimated for most measures in these sectors, economic analysis was not conducted for one energy measure, one water measure, and two transport measures due to limitations in data availability and resource constraints.

[21] Annual energy savings were based on estimated reductions in 2020 and valued using average bundled PG&E retail rates by customer class. While actual rates will depend on each customer's usage and the specific rate schedules, such an analysis of utility rates was beyond the scope of this analysis.

[22] The simple payback period is calculated by dividing the total initial cost by annual cost savings.

[23] Net costs are discounted over the lifetime of the measure at a rate of 5%, which is consistent with many other GHG emissions reduction cost analyses.

3.4 Summary of GHG Emissions Reductions

When combined with state efforts, the GHG reduction measures described in the City's CAP would reduce community GHG emissions by approximately 565,000 to 571,000 MT CO_2e. The largest GHG reductions due to local initiatives are achieved by residential and commercial energy (both energy efficiency and renewable energy) programs, transportation measures, and waste reduction measures. In many cases, measures that achieve the high GHG reductions are often the most cost effective. While the City of Stockton, residents and businesses, and other public sector agencies such as school districts would incur costs to implement the GHG reduction measures, in some cases they would also realize long-term savings resulting from reduced energy and maintenance costs that can help recoup initial investments. Actions not currently quantified (see Chapter 4), as well as local effects of California's cap-and-trade program, could also contribute additional reductions in the City.

As shown in Table 3-1, approximately 83% and 17% of the GHG reductions achieved by the CAP are attributed to state- and city-level programs, respectively. The City has limited control over the implementation of state programs. Conversely, the state must defer to the City for certain planning decisions that must be made at a local level. The programs described below outline a path for reducing community emissions in conjunction with planned state actions. Figure 3-1 summarizes GHG emissions reductions by sector.

Table 3-1. Summary of GHG Emissions Reductions by Sector

GHG Emissions	MT CO_2e	Percent of Total Reduction (%)
State Programs	**473,415**	**83%**
Local Programs		
Development Review Process	4,963	1%
Building Energy Use Measures	49,271	9%
Land Use and Transportation Measures	13,619 to 19,360	2% to 3%
Waste Generation Measures	4,245	1%
Water Consumption Measures	16,228	3%
Wastewater Treatment Measures	312	0.1%
Urban Forestry Measures	75	0.0%
High GWP GHG Measures	255	0.0%
Off-Road Vehicle Measures	2,622	0.5%
Subtotal for Local programs	**91,590 to 97,331**	**16% to 17%**
Total Reductions	**565,005 to 570,746**	**100%**

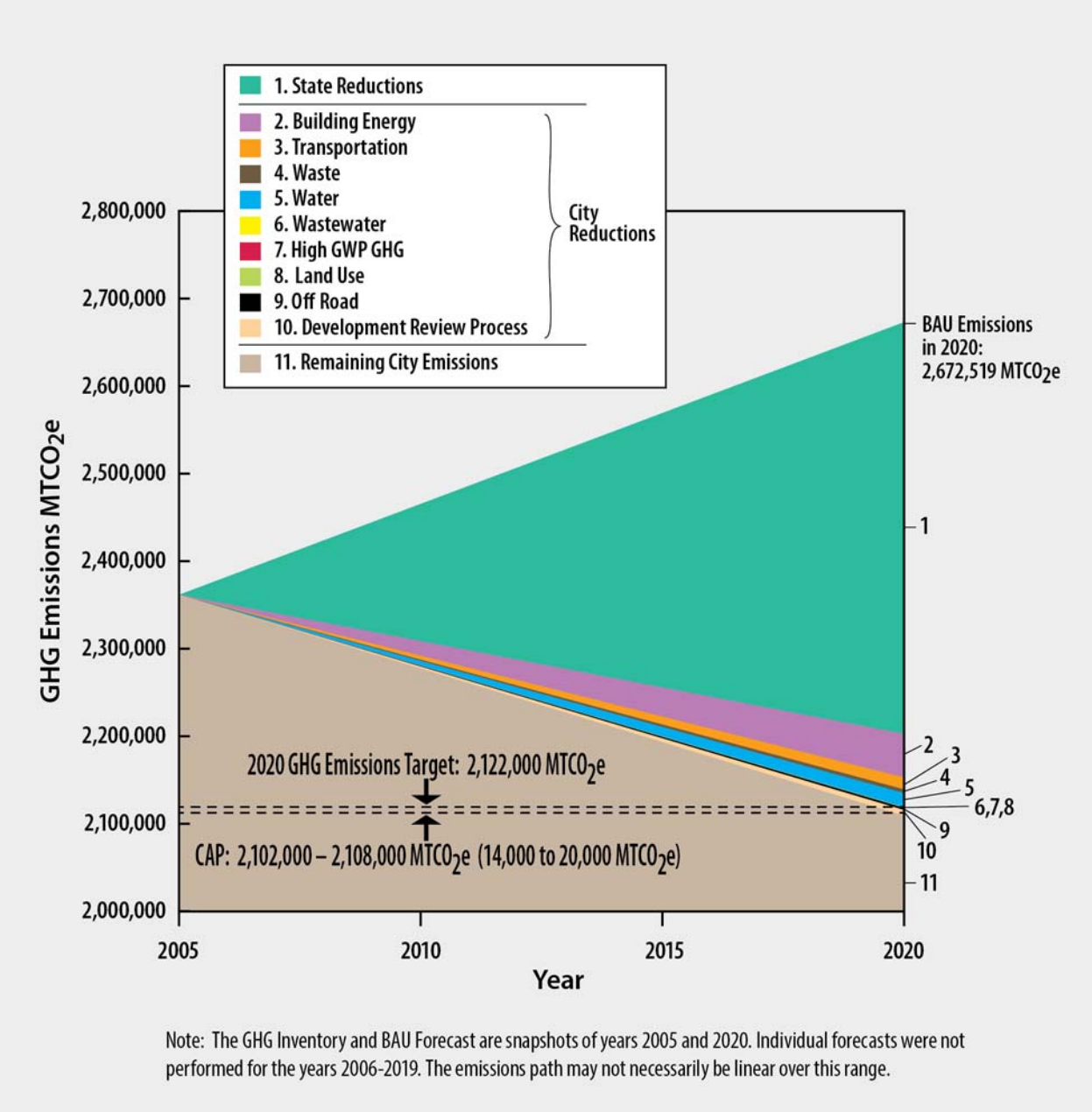
Table 3-2 presents a summary of GHG reductions, estimates of cost effectiveness for GHG reduction measures in the City's CAP, and expected benefits. Costs per ton of GHG emissions (which take into account upfront capital investments, operations and maintenance costs and annual cost savings (e.g., from reduced energy usage) are shown,[24] along with a simple payback period.[25] Costs are based on the mid-point of ranges identified for each measure (the cost ranges are shown in

[24] This range of higher- and lower-cost scenarios is primarily based on variations in upfront investments.

[25] The simple payback period represents the number of years before the initial investment is repaid.

Appendix C and discussed in text below). Because costs are annualized over the lifetime of each measure, a negative value indicates that the measure is cost-saving when considered over its full lifetime. Energy sector measures are often highly cost-effective due to energy cost reductions.

Figure 3-1. Summary of Emissions Reductions by Sector



Note: The GHG Inventory and BAU Forecast are snapshots of years 2005 and 2020. Individual forecasts were not performed for the years 2006-2019. The emissions path may not necessarily be linear over this range.

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Measure Number	GHG Reduction Measure	GHG Reduction	Additional Cost of CAP?	Cost/Ton	Simple Payback Period	Lifetime	Net Present Value	Cobenefits	Notes
State Measures									
State Measures	Energy, transportation, waste, high GWP measures	473,415	No	Residents, business, City government, and other public agencies will incur additional costs for energy, transportation fuel and other expenses due to state initiatives, but will also incur savings where state requirements result in long-term efficiencies (like from Title 24 requirements). However, these costs and savings will occur with or without adoptions of the CAP. Other cobenefits similar to those articulated by sector below.					
Multi-Sectoral									
DRP-1	Development Review Process – 29% reduction for discretionary project	4,963	No	New project proponents will incur additional costs depending on the project level measures selected to meet the 29% reduction requirement. Building owners will incur savings where measures are adopted that result in energy-efficient structures and other measures. However, these costs and savings will occur with or without adoptions of the CAP. Cobenefits depend on measures selected.					
Building Energy									
Energy-1	Green Building Ordinance	N/A	No	Adopted ordinance has been suspended and revisions are under development. City consideration of ordinance is a separate matter from the CAP. CAP does not assume any reductions at this time from the ordinance. When the new ordinance is better defined, the City will evaluated potential GHG reductions beyond those assumed for Title 24 now and in the future					
Energy-2a	Outdoor Lighting Upgrades (Municipal)	496	Yes	-$325	5 to 13	5 to 17	$16,000,000	• Reduced energy use • Energy security and diversity • Reduced price volatility • Reduced air pollution • Resource conservation • Increased property value • Public health improvements • Increased quality of life	New municipal lighting program. After installation maintenance is same or less than current lights.
Energy 2b	Outdoor Lighting Upgrades (Private)	1,702	Yes	-$1,149	2 to 3	9 to 11	$1,800,000		New energy efficiency program (Energy-2a, 3, and 4).
Energy-3	Energy Efficiency Programs to Promote Retrofits for Existing Residential Buildings	20,182	Yes	-$247	4 to 9	18	$58,000,000		
Energy-4	Energy Efficiency Programs to Promote Retrofits for Existing Commercial Buildings	10,227	Yes	-$423	1 to 2	18	$51,000,000		
Energy-5a	Solar Powered Parking (Owner-financed)	1,586	Yes	-$10	13 to 17	30	$500,000		New solar program (Energy-5 and Energy-6)
Energy-5b	Solar Powered Parking (PPA-financed)		Yes	-$349	<1	25	$14,000,000		
Energy-6a	Residential and Non-Residential Rooftop Solar (Owner-Financed)	15,078	Yes	$60	17 to 20	30	-$27,000,000		
Energy-6b	Residential and Non-Residential Rooftop Solar (PPA financed)		Yes	-$208	<1	25	$79,000,000		
Land Use and Transportation									
Trans-1	Land Use/Transportation System Design Integration	1,440 - 7,181	Yes	Not estimated	Not estimated	>30	Not estimated	• Reduced energy use • Reduced air pollution • Public health improvements • Energy security • Increased quality of life	Net costs depend on cost differential between downtown development and outlying development and may be negative or positive. New program cost for City. RTD costs for potential transit service increase included separately in Transit Plan.
Trans-2	Parking Polices	1,557	Yes	Not estimated	Not estimated	9	Not estimated		New City program. Studies have shown parking enforcement pays for itself in terms of staffing for parking personnel as well as minor capital, and O &M costs. RTD costs for potential transit service increase included separately in Transit Plan.
Trans-3	Transit System Support	1,272	Yes	Not estimated	Not estimated	12/20	Not estimated		Park and ride, shelters, signals, etc.. Lifetime of 12 years for park and rise and 20 for bus shelters. RTD costs for potential transit service increase included separately in Transit Plan.
Trans-4	Efficient Goods Movement	767	No	Grade separations already planned and will be built with or without CAP.					Grade separations already planned and will be built with or without CAP.
Trans-5	Reduce Barriers for Non-Motorized Travel	1,459	Yes	-$1,317	2	20	$15,000,000		New program.
Trans-6	Transit System Improvements	--	Yes	--	Not estimated	--	Not estimated		Transit Plan represents investments to keep current transit share (3%) constant with population growth. No gain over BAU is presented, because BAU presumed same transit share as 2005. See Transit Plan in Appendix D for details.

Measure Number	GHG Reduction Measure	GHG Reduction	Additional Cost of CAP?	Cost/Ton	Simple Payback Period	Lifetime	Net Present Value	Cobenefits	Notes
Trans-7	Safe Routes to School	1,986	Yes	-$1,347	2	20	$33,000,000	• Reduced energy use • Reduced air pollution • Public health improvements • Energy security • Increased quality of life	New combined safe routes to school program (Trans-7 and Trans-8a)
Trans-8a	Additional Safe Routes to School	1,986	Yes	-$1,347	2	20	$33,000,000		
Trans-8b	Transportation Demand Management	3,152	Yes	Depends on TDM approaches	Net Cost	Depends on TDM approaches	Not estimated (net cost)		New voluntary TDM program.
Waste									
Waste-1	Increased Waste Diversion	4,245	In part	$942	Net Cost	9	-$31,000,000	• Reduced air pollution • Resource conservation	Existing but expanded program. Lifecycle material cost savings not estimated. Assumed ramps up to 75% diversion by 2020. Costs and savings would be borne directly by the waste management company, but costs likely to be passed on to residents, businesses, and the City.
Water									
Water-1	Comply with SB X7-7	9,680	No	State mandate. Residents, business, City government, and other public agencies will incur additional costs for water service and facilities, but will also incur savings for water efficiencie, but these will occur with or without adoptions of the CAP. Cobenefits same as for Water-2 below.					
Water-2	Promote Water-Efficiency for Existing Development	6,548	In part	$325	8	10	-$12,000,000	• Reduced energy use • Reduced air pollution • Resource conservation • Increased property value	Existing program but expanded.
Wastewater									
Wastewater-1	Energy Efficiency Improvements at the RWCF	312	Yes	-$308	2	5 to 10	$600,000	• Reduced energy use • Reduced air pollution	New program.
Urban Forestry									
Urban Forestry-1	Urban Tree Planting Programs	75	In part	-$1,375	Not estimated	40	$1,800,000	• Reduced energy use • Reduced air pollution • Reduced urban heat island effect • Increased quality of life	Existing program but expanded. Annual savings not constant but expand over time. Annual benefits quantified include electricity reduced, CO2 and air quality emission reductions, as well as property value increases. Total lifetime net savings per tree estimated at $0 for a small tree and $1,400 for a medium tree.
High Global Warming Potential GHGs									
HGWP GHG-1	Residential Responsible Appliance Disposal (RAD) Programs	255	Yes	Not estimated	Net Cost	9	Not estimated (net cost)	• Reduced air pollution	New program. Assumed to ramp up to full operation by 2020.
Off-Road Vehicles									
Off-Road-1	Electric Powered Construction Equipment	1,427	Yes	Not estimated	Not estimated	9	Not estimated	• Reduced air pollution • Public health improvements • Increased quality of life	New combined off-road program (Off-Road-1, 2, 3)
Off-Road-2	Reduced Idling Times for Construction Equipment	920	Yes	$586	3 to 30	9	-$4,200,000		
Off-Road-3	Electric Landscaping Equipment	275	Yes	Not estimated	Not estimated	9	Not estimated		
Total									
State Reductions		*473,415*	*No*	*Not Applicable*				*See above*	*Excludes unquantified costs. Net present value of entire program not fully quantifiable at this time as explained in text and in Appendix C.*
Local Reductions (Owner financed solar scenario, Trans-1/3000 units)		97,331	*Varies*	*See above*	*Varies*	*Varies*	$136,500,000		
Local Reductions (PPA financed solar scenario, Trans-1/300 units)		91,590					$256,000,000		
Total Reductions (Trans-1/3000 units)		570,746							
Total Reductions (Trans-1/300 units)		565,005							

Notes:
1. Source for Cost/Ton and Payback term estimates = Capital and O & M costs in Table 3-3 and Table 3-4 and cost source estimates in Appendix C.
2. Totals do not include potential RTD costs for Trans-1, 2, 3, and 6 which are discussed in Table 3-3.

3.5 Summary of Cost/Benefit Analysis

A quantitative and qualitative cost/benefit analysis was done of the GHG reduction measures included in this Plan. Wherever possible, the implementation and operational costs and savings were identified for the reduction measures in order to present the cost-effectiveness in terms of dollars per ton of GHG reduced. Costs and savings were identified separately for the private sector and for the City government. An analysis of benefits was also done for each measure to identify the other benefits that could derive from GHG reduction measure implementation.

3.5.1 Costs and Savings

The City has designed the CAP to rely, for the most part, on voluntary, incentive-based measures for existing development, flexible performance-based measures for new development, and only uses mandatory measures for new development where required by prior state or local mandates (such as for water conservation) or where advantageous to the City. By providing flexibility, the intent is that the City government, residences, and businesses would employ the most cost-effective methods to reduce GHG emissions.

The City of Stockton, private residents and businesses, and other public sector agencies, such as school districts, would incur costs to implement GHG reduction measures, but in many cases, they would also realize long-term savings resulting from reduced energy and maintenance costs that can help recoup initial investments. In the building energy sector, costs would be borne by building owners to upgrade to energy efficient technologies, In the transportation sector, many of the measures involve capital improvement projects and operational improvements that would be funded through a mix of local, state, and federal funding sources. Implementation costs for the City government would be associated with staff time to develop energy, waste and transportation programs and ordinances as necessary, promote incentives for voluntary energy efficiency and renewable energy, supervise the Development Review Process, building and fleet upgrades for City municipal operations, and implement new programs.

Some of the most cost-effective measures—and the biggest GHG reductions—can be found in the building energy sector. For example, investments to upgrade to energy efficient lighting and improve the energy efficiency of existing buildings can have payback times of as little as 1 to 5 years through reduced energy bills. Other measures have longer-term payback periods but can still have a positive net present value (i.e., their costs can be fully recouped in a reasonable amount of time). Other measures would represent net costs in the long-term, based on current energy prices, but may have shorter payback periods if energy prices increase in the future.

The cost-benefit analysis is discussed further in Chapter 3, and the methodology used to develop the analysis is presented in Appendix C.

Table 3-3 summarizes the estimated costs and savings for the City government. Table 3-4 summarizes the estimated costs and savings for the private sector.

A competitiveness analysis (EPS 2013) has been completed to analyze the potential net effects of CAP policies, programs, and financing measures on competitiveness of business in Stockton which is included in Appendix H. The competitiveness analysis concludes that the measures detailed in the CAP have been designed to minimize cost burdens on businesses and residents and thus the net

competitiveness impacts are likely to be very limited or insignificant. The analysis notes that while introducing some new costs, the CAP would also create offsetting competitiveness benefits stemming from improved environmental conditions, quality of life, urban vibrancy, and other factors that influence attractiveness, reputation/brand, and innovation. The analysis also describes that CAP implementation will also result in financial returns on related investments and regional economic benefits which offset the limited negative cost-related competitiveness impacts.

3.5.2 Benefits

Many of the measures included in the CAP would result in long-term economic, environmental, health and other benefits for the City and its residents and businesses in addition to the expected GHG emission reductions.

Implementing the CAP would avoid the generation of approximately 565,000 to 571,000 MT CO_2e, which is equivalent to the following actions (U.S. Environmental Protection Agency 2011).

- Removing more than 120,000 passenger vehicles from the road each year.
- Reducing gasoline consumption by more than 64 million gallons.
- Consuming more than 1.3 million fewer barrels of oil.

Implementing the CAP would reduce the generation of criteria air pollutants in Stockton, including ozone, carbon monoxide, and fine particulates, which would improve public health for the community. Stockton residences and businesses that implement energy efficiency upgrades as a result of this plan would see future savings due to lower future energy bills. Transportation improvements included in this plan would increase mobility and alternative modes of transportation for Stockton residents and visitors. Water improvements included in this plan promote wise use of limited water resources and enhance water quality. Waste reductions included in this plan would reduce the need for landfill space. Other benefits of this plan includes reduction of electricity, natural gas, and gasoline usage which reduces consumer sensitivity to potential increases in future energy prices. Reduction of gasoline consumption also has an additional benefit of reducing dependence on foreign oil supplies.

Benefits are discussed further in Chapter 3 and identified for each measure in Appendix C. As noted above, the competitiveness analysis will also examine the potential for job creation as a result of Plan implementation.

Measure Number	GHG Reduction Measure	GHG Reduction	Implementing Costs (Narrative)	Costs over No-CAP Scenario?	One-time Capital Costs to City	One-time Development Costs	Total one-time City Costs	City O & M Costs	Annual City Staff Costs	Total Change in City Annual Costs
Costs and Savings for City of Stockton Municipal Government										
State Measures										
State Measures	Energy, transportation, waste, high GWP measures	473,415	No local implementation required, except changes in Title 24 required	No.	--	--	--	--	--	--
Multi-Sectoral										
DRP-1	Development Review Process – 29% reduction for discretionary project	4,963	Part of normal project review. Additional time to review GHG emissions inventories and reduction measure identification.	No. Proposal represents current City CEQA practice and would be required with or without a CAP.	--	--	--	--	--	--
Building Energy					*$5,800,000*	*$210,000*	*$6,010,000*	*-$650,000*		
Energy-1	Green Building Ordinance	N/A	Ordinance completed. Staff time to help applicant comply with ordinance and monitor Ordinance implementation.	No. Ordinance is already required with or without a CAP.	--	--	--	--		
Energy-2a	Outdoor Lighting Upgrades (Municipal)	496	Staff time to develop program for municipal lighting upgrade.	Yes. New municipal lighting program	$5,800,000	$35,000	$5,835,000	-$650,000		
Energy-2b	Outdoor Lighting Upgrades (Private)	1,702	Staff time to develop program for voluntary lighting incentives, EE retrofits for residential and EE retrofits for commercial	Yes. New energy efficiency promotion program (Energy-2b, 3, and 4)	$0	$105,000	$105,000	$0		
Energy-3	Energy Efficiency Programs to Promote Retrofits for Existing Residential Buildings	20,182								
Energy-4	Energy Efficiency Programs to Promote Retrofits for Existing Commercial Buildings	10,227								
Energy-5	Solar Powered Parking (Owner-financed)	1,586	Staff time to develop program for voluntary solar parking and rooftop solar	Yes. New solar promotion program (Energy-5 and Energy-6)	$0	$70,000	$70,000	$0		
Energy-6	Residential and Non-Residential Rooftop Solar (Owner-Financed)	15,078								
Land Use and Transportation					*$21,765,000*	*$750,600*	*$22,490,600*	*$529,000*		
Trans-1	Land Use/Transportation System Design Integration	1,440 - 7,181	Staff time to modify development code, work with infill developers, assess constraints, etc.	Yes. New program.	It depends.	$70,000	$70,000	It depends.		
Trans-2	Parking Polices	1,557	Staff time for upfront program development. Police department time for increased enforcement offset by parking revenue and fines. Costs for new signage and meters.	Yes. New program.	$25,000	$54,600	$54,600	$0		
Trans-3	Transit System Support	1,272	Staff time for planning for new park and ride facilities and for promoting discounted transit pass program (e.g. Upass program)	Yes. New transit support program.	$640,000	$35,000	$675,000	$49,000		
Trans-4	Efficient Goods Movement	767	Staff time for grade separation project planning	No. Grade separations are planned with or without CAP.	--	--	--	--		
Trans-5	Reduce Barriers for Non-Motorized Travel	1,459	Staff time to amend City Zoning Code for multi-modal street designs. City planning and project administration for new bike paths.	Yes. New bike path and multi-modal designs program.	$6,100,000	$70,000	$6,170,000	$135,000		
Trans-6	Transit System Improvements	--	Staff time to coordinate service improvements with RTD not assumed to be substantial change over present responsibilities.	Yes. Staff costs for coordination with RTD. (See below for costs to RTD)	$0	$115,000	$115,000	$0		
Trans-7a	Safe Routes to School	1,986	Staff time for planning for new facilities.	Yes. New Safe Routes to School program (Trans-7, -8a)	$15,000,000	$406,000	$15,406,000	$345,000	*$140,000*	
Trans-8a	Additional Safe Routes to School	1,986								
Trans-8b	Transportation Demand Management	3,152	Staff time for planning for TDM program promotion	Yes. New TDM support program.	$0	$70,000	$70,000	$0		

Measure Number	GHG Reduction Measure	GHG Reduction	Implementing Costs (Narrative)	Costs over No-CAP Scenario?	One-time Capital Costs to City	One-time Development Costs	Total one-time City Costs	City O & M Costs	Annual City Staff Costs	Total Change in City Annual Costs
Waste					*$0*	*$105,000*	*$105,000*	*$0*		
Waste-1	Increased Waste Diversion	4,245	Staff time to promote/plan increased waste diversion and coordinate with waste providers. Operations would represent continuation of prior waste diversion efforts. Assumed new facilities provided by waste haulers.	Yes. Expansion of existing program.	Assumed no new City facilities	$105,000	$105,000	Assumed no new City facilities		
Water					*0.00*	*22,000*	*22,000*	*$0*		
Water-1	Comply with SB X7-7	9,680	Staff time to develop additional programs to lower per capita water use.	No. SB X7 7 applies whether or not there is a CAP.	--	--	--	--		
Water-2	Promote Water-Efficiency for Existing Development	6,548	Staff time to promote existing water fixture installations. Represents continuation of prior utility efforts by City on water conservation so ongoing costs are limited.	Yes. Expansion of existing program.	$0	$22,000	$22,000	$0		
Wastewater					*$300,000*	*$70,000*	*$370,000*	*-$150,000*		
Wastewater-1	Energy Efficiency Improvements at the RWCF	312	Staff time to plan for improvements.	Yes. New program. Net savings during operations	$300,000	$70,000	$370,000	-$150,000		
Urban Forestry					*$590,000*	*$35,000*	*$625,000*	*$120,000*		
Urban Forestry-1	Urban Tree Planting Programs	75	Staff time for planning for plantings.	Yes. Not a new program but additional plantings.	$590,000	$35,000	$625,000	$120,000		
High Global Warming Potential GHGs					*$0*	*$35,000*	*$35,000*	*$0*		
HGWP GHG-1	Residential Responsible Appliance Disposal (RAD) Programs	255	Staff time for planning and promotion of new program and coordination with contracted hauler(s).	Yes. New program by solid waste contractor under City contract. New facilities assumed provided by contractor.	$0	$35,000	$35,000	$0		
Off-Road Vehicles					*$0*	*$126,000*	*$126,000*	*$0*		
Off-Road-1	Electric Powered Construction Equipment	1,427	Staff time for planning and promotion of new offroad incentive program, idling ordinance and coordination with construction fleet owners.	Yes. New Offroad program (Combined Off-Road 1, 2, and 3)	$0	$126,000	$126,000	$0		
Off-Road-2	Reduced Idling Times for Construction Equipment	920								
Off-Road-3	Electric Landscaping Equipment	275								
Total										
State Reductions		*473,415*		***No***	*Not Applicable*					
Local Reductions		*93,398 to 98,977*	*See above*	*Totals do not include additional capital or O & M costs if incurred with Trans-1*	*$28,455,000*	*$1,423,600*	*$29,853,600*	*-$151,000*	*$140,000*	*-$11,000*
Total Reductions		*563,959 to 569,958*								

Notes:
1. Sources for Capital Costs and Operations and Maintenance Costs = Appendix C and ICF estimates.
2. Estimates of Development and staff annual costs: ICF International and City of Stockton staff estimates
3. City may be able to reduce or offset operating costs further due to energy efficiency retrofits of municipal buildings, but this is not included in this table.

RTD Costs

Measure Number	GHG Reduction Measure	GHG Reduction	Implementing Costs (Narrative)	Costs over No-CAP Scenario?	Capital Costs to RTD	RTD O & M Costs
Trans-1	Land Use/Transportation System Design Integration	1,440 - 7,181	Additional costs may be incurred if infill development result in increased transit use (as opposed to carpooling or access by walking or biking). If transit demand increases, then capital and operating costs for additional bus service may occur depending on existing services and capacity. Costs to RTD not estimated separately for this measure but assumed included in costs included in Transit Plan (Measure Trans-6).			
Trans-2	Parking Polices	1,557	Additional costs may be incurred if parking changes result in increased transit use (as opposed to carpooling or access by walking or biking). If transit demand increases, then capital and operating costs for additional bus service may occur depending on existing services and capacity. Costs to RTD not estimated separately for this measure but assumed included in costs included in Transit Plan (Measure Trans-6).			
Trans-3	Transit System Support	1,272	Improvements should increase transit ridership, which may result in additional capital and operating costs for additional bus service depending on existing services and capacity for affected routes. Costs to RTD not estimated separately for this measure but assumed included in costs included in Transit Plan (Measure Trans-6).			
Trans-6	Transit System Improvements	--	Capital and operations costs for additional bus service.	Yes. Costs to RTD to maintain or improve over current transit mode share.	$2.5 million plus undetermined other costs for RTD (see Transit Plan)	$8.3 million to maintain current mode split plus $2.9 million for other costs (see Transit Plan)

Notes:
1. See Appendix D (Transit Plan) for more details on costs associated with transit service.

Measure Number	GHG Reduction Measure	GHG Reduction	Additional Cost of CAP to Private Sector?	Additional Capital Costs	Additional O & M Cost/year	Private Entity Incurring Costs	Additional Savings/Year	Private Entity Incurring Savings	Annual Net	Cost/Ton	Lifetime	Net Present Value	Notes
State Measures													
State Measures	Energy, transportation, waste, high GWP measures	473,415	No	Residents, business, City government, and other public agencies will incur additional costs for energy, transportation fuel and other expenses due to state initiatives, but will also incur savings where state requirements result in long-term efficiencies (like from Title 24 requirements). However, these costs and savings will occur with or without adoptions of the CAP. Other cobenefits similar to those articulated by sector below.									
Multi-Sectoral													
DRP-1	Development Review Process – 29% reduction for discretionary project	4,963	No	New project proponents will incur additional costs depending on the project level measures selected to meet the 29% reduction requirement. Building owners will incur savings where measures are adopted that result in energy-efficient structures and other measures. However, these costs and savings will occur with or without adoptions of the CAP. Cobenefits depend on measures selected.									
Building Energy													
Energy-1	Green Building Ordinance	N/A	No	Adopted ordinance has been suspended and revisions are under development. City consideration of ordinance is a separate matter from the CAP. CAP does not assume any reductions at this time from the ordinance. When the new ordinance is better defined, the City will evaluated potential GHG reductions beyond those assumed for Title 24 now and in the future									
Energy-2a	Outdoor Lighting Upgrades (Municipal)	496	No	Municipal Program									
Energy 2b	Outdoor Lighting Upgrades (Private)	1,702	Yes	$5,000,000	$0	Building owners	$2,200,000	Building owners	$2,200,000	-$1,149	9 to 11	$1,800,000	Voluntary programs to increase energy efficiency.
Energy-3	Energy Efficiency Programs to Promote Retrofits for Existing Residential Buildings	20,182	Yes	$37,500,000	$0	Building owners	$6,000,000	Homeowners and multi-family residential building owners	$6,000,000	-$247	18	$58,000,000	
Energy-4	Energy Efficiency Programs to Promote Retrofits for Existing Commercial Buildings	10,227	Yes	$5,300,000	$0	Building owners	$4,600,000	Building owners	$4,600,000	-$423	18	$51,000,000	
Energy-5a	Solar Powered Parking (Owner-financed)	1,586	Yes	$38,400,000	$200,000	Building owners	$1,800,000	Building owners	$1,600,000	-$10	30	$500,000	Voluntary program to increase solar use.
Energy-5b	Solar Powered Parking (PPA-financed)		Yes	$0	$0	Building owners	$1,000,000	Building owners	$1,000,000	-$349	25	$14,000,000	
Energy-6a	Residential and Non-Residential Rooftop Solar (Owner-Financed)	15,078	Yes	$319,700,000	$7,000,000	Building owners	$17,400,000	Homeowners and non-residential building owners	$10,400,000	$60	30	-$27,000,000	
Energy-6b	Residential and Non-Residential Rooftop Solar (PPA financed)		Yes	$0	$0	Building owners	$5,600,000	Homeowners and non-residential building owners	$5,600,000	-$208	25	$79,000,000	
Land Use and Transportation													
Trans-1	Land Use/Transportation System Design Integration	1,440 - 7,181	Yes	May be more or less than comparable "edge" development	May be more or less than comparable "edge" development	Building owners/developers	$2,400,000 to $12,000,000	Residents (vehicle/fuel savings)	$2,400,000 to $12,000,000	Not estimated	>30	Not estimated	Private developers will incur costs of infill development which may be higher or lower relative to cost for development on the edge of the City.
Trans-2	Parking Polices	1,557	Yes	--	Parking costs would increase for those driving	Residents/visitors (parking fees)	$2,600,000	Residents/visitors (vehicle/fuel savings)	$2,600,000	--	--	--	Municipal program but additional parking costs would be incurred by individuals and businesses. Those using transit may incur net savings compared to vehicle use and parking costs.
Trans-3	Transit System Support	1,272	Yes	--	Bus Fares for those using transit	Fare riders	$2,100,000	Residents (vehicle/fuel savings)	$2,100,000	--	--	--	Municipal program (City/RTD)
Trans-4	Efficient Goods Movement	767	No	City of Stockton, regional, state, and federal funds for previously planned and funded projects.									
Trans-5	Reduce Barriers for Non-Motorized Travel	1,459	No	--	--	--	$2,400,000	Bicyclists/pedestrians (vehicle/fuel savings)	$2,400,000	--	--	--	Municipal program.
Trans-6	Transit System Improvements	--	No	--	Bus Fares for those using transit	Fare riders	Not estimated	Residents (vehicle/fuel savings)		--	--	--	Municipal program (City/RTD)
Trans-7	Safe Routes to School	1,986	No	--	--	--	$3,300,000	Residents (vehicle/fuel savings)	$3,300,000	--	--	--	Municipal program.
Trans-8a	Additional Safe Routes to School	1,986	No	--	--	--	$3,300,000	Residents (vehicle/fuel savings)	$3,300,000	--	--	--	
Trans-8b	Transportation Demand Management	3,152	Yes	Depends on TDM approaches	Depends on TDM approaches	Employers, Schools, other public agencies	$5,200,000	Employee, students (vehicle/fuel savings)	$5,200,000	Depends on TDM approaches	Depends on TDM approaches	Not estimated (net cost)	New voluntary TDM program.
Waste													
Waste-1	Increased Waste Diversion	4,245	Yes	Costs associated with recycling and diversion facilities not quantified.	$5,800,000	Building owners Residents Waste haulers	Not estimated	Manufacturers, Recyclers	-$5,800,000	$942	9	-$31,000,000	Private parties may experience increased waste hauling fees.

Measure Number	GHG Reduction Measure	GHG Reduction	Additional Cost of CAP to Private Sector?	Additional Capital Costs	Additional O & M Cost/year	Private Entity Incurring Costs	Additional Savings/Year	Private Entity Incurring Savings	Annual Net	Cost/Ton	Lifetime	Net Present Value	Notes
Water													
Water-1	Comply with SB X7-7	9,680	No	State mandate. Residents, business, City government, and other public agencies will incur additional costs for water service and facilities, but will also incur savings for water efficiencie, but these will occur with or without adoptions of the CAP. Cobenefits same as for Water-2 below.									
Water-2	Promote Water-Efficiency for Existing Development	6,548	Yes	$12,000,000	$0	Building Owners Residents	$1,500,000	Building Owners Residents (water bills)	$1,500,000	$325	10	-$12,000,000	Existing program but expanded.
Wastewater													
Wastewater-1	Energy Efficiency Improvements at the RWCF	312	No	Municipal Program									
Urban Forestry													
Urban Forestry-1	Urban Tree Planting Programs	75	No	Municipal Program, but will produce tangible benefits for residents and business in terms of reduced energy costs, air pollution reduction, home prices, and quality of life improvements.									
High Global Warming Potential GHGs													
HGWP GHG-1	Residential Responsible Appliance Disposal (RAD) Programs	255	Yes	$0	Operational costs to run the drop-off center (not quantified)	Non-residential building owners Residents	Sale of recyclables	Waste hauler, recyclers		Not estimated	9	Not estimated (net cost)	Private parties may experience increased waste hauling fees.
Off-Road Vehicles													
Off-Road-1	Electric Powered Construction Equipment	1,427	Yes	Additional equipment costs	Electricity costs	Construction fleet owners	Fuel cost savings	Construction fleet owners (fuel savings)		Not estimated	9	Not estimated	Construction fleets owners incur costs and savings net of any state, regional or federal incentives that may be identified.
Off-Road-2	Reduced Idling Times for Construction Equipment	920	Yes	$8,150,000	$0	Construction contractors	$500,000	Construction contractors (fuel savings)	$500,000	$586	9	-$4,200,000	
Off-Road-3	Electric Landscaping Equipment	275	Yes	Additional equipment costs	Electricity costs	Landscaping equipment owners	Fuel cost savings	Landscaping equipment owners (fuel savings)		Not estimated	9	Not estimated	
Total													
State Reductions		*473,415*	*No*	*Not Applicable*									
Local Reductions (Owner financed solar scenario, Trans-1/3000 units)		97,331	*Varies*	$426,050,000	$13,000,000	*Varies*	$64,900,000	*Varies*	$51,900,000	*See above*	*Varies*	$37,100,000	*Does not include unquantified costs noted above.*
Local Reductions (PPA financed solar scenario, Trans-1/300 units)		91,590		$67,950,000	$5,800,000		$42,700,000		$36,900,000			$156,600,000	
Total Reductions (Trans-1/3000 units)		570,746											
Total Reductions (Trans-1/300 units)		565,005											

Notes:
1. Source for Capital and O&M costs = Appendix C and ICF estimates.
2. Totals do not include non-estimated measure costs.

3.6 GHG Reduction Measures

GHG reduction measures are discussed below. The discussion includes an overview of state measures and a measure-by-measure description of expected GHG reductions, costs, and benefits. Appendix C provides more details on how the GHG effectiveness and cost and saving analyses were developed and identifies the benefits for each measure in greater detail.

3.6.1 State Programs

Actions undertaken by the state will contribute to GHG reductions in the City. For example, as discussed in Chapter 1, the state requires electric utility companies to increase their procurement of renewable resources by 2020. Renewable resources, such as wind and solar power, produce the same amount of energy as coal and other traditional sources, but do not emit any GHGs. By generating a greater amount of energy through renewable resources, electricity provided to the City will be cleaner and less GHG intensive than if the state hadn't required the renewable standard. Even though state measures do not always require local government action, emissions reductions achieved by this and other state measures will help lower GHG emissions in the City.

The City has quantified ten statewide initiatives that will contribute to community reductions within Stockton.[26] The majority of these programs will improve building energy efficiency and renewable energy generation. Specifically, Title 24 standards for new residential and non-residential buildings will require building shells and components be designed to conserve energy and water. Similarly, energy efficiency strategies required by AB 1109 will reduce electricity consumption lighting. Finally, the state's RPS will increase the amount of electricity generated by renewable resources.

Over the past several decades, California has become a leader in establishing initiatives to reduce fuel consumption and on-road vehicle emissions. AB 1493 (Pavley) will reduce GHG emissions from automobiles and light duty trucks by 30% from 2002 levels by the year 2016. The proposed Advanced Clean Car initiative will introduce new standards for model years 2017–2025, and will increase fuel economy up to 43 miles per gallon by 2020. These new fuel economy standards are more stringent than what is currently required under Federal CAFE standards. CARB has also adopted the Low Carbon Fuel Standard, which requires a 10% reduction in the carbon intensity of California's transportation fuels by 2020 and outlined several efficiency measures in the AB 32 Scoping Plan. Together, these measures will reduce light- and heavy-duty vehicle emissions.

A complete list of state programs included in the City's CAP, as well as anticipated GHG reductions, is presented in Table 3-5. Appendix C provides more description of each state measure.

[26] State measures to reduce industrial sources were not quantified as industrial source emissions were not included in the City's inventory. Regulation of industrial emissions is primarily done by the San Joaquin Air Pollution Control District and the California Air Resources Board and thus is not a normal prerogative of local government.

Table 3-5. GHG Reductions Achieved within Stockton by State Programs (MT CO_2e) [a]

State Actions to Reduce GHG Emissions	MT CO_2e
State-1: Senate Bills 1078/107/X 1-2 (Renewable Portfolio Standard)	101,208
State-2: Title 24 Standards for Non-Residential and Residential Buildings	26,196
State-3: AB 1109 (Huffman) Lighting Efficiency and Toxics Reduction Act	23,314
State-4: AB 32 Solar Water Heaters	886
State-5: AB 1493 (Pavley I)	115,713
State-6: Advanced Clean Cars [b]	16,847
State-7: Executive Order S-1-07 (Low Carbon Fuel Standard)	112,962
State-8: AB 32 Transportation Reduction Strategies [c]	23,458
State-9: AB 32 High Global Warming Potential GHG Reduction Strategies	18,697
State-10: AB 32 Landfill Methane Program	34,135
Total Reductions from State Programs	**473,415**

[a] Please refer to Appendix C for quantification details.

[b] Reductions calculated based on assumed improvement in fuel economy to 43 miles per gallon by 2020 in response to federal/state standards for 2017 – 2025.

[c] Includes the following initiatives: tire pressure program, low friction oils, and heavy-duty aerodynamic efficiency.

3.6.2 Overview of Local Voluntary and Mandatory Programs

The section summarizes local efforts that the City proposes to further reduce community-wide GHG emissions. Measures that are required by State law, such as compliance with Senate Bill X7-7, or existing City regulations, such as the Green Building Ordinance, would be mandatory for either existing and/or new development (and are identified with an [M]). The City would require implementation of these measures, pursuant to state and new or existing local laws and regulations. Measures that would be implemented through incentive-based approaches, such as building retrofits, would be voluntary and are marked with a [V]. GHG reductions associated with these voluntary measures were quantified based on anticipated participation rates. Measures that would be implemented by the City but that would not create specific mandates for existing or new development are marked with a [City] or [RTD] mark. An example of this would be outdoor street lighting or certain transportation measures. Some measures are a combination of City measures and voluntary or mandatory measures.

The local measures identified by the City would improve building energy efficiency, increase renewable energy development, reduce vehicle and other transportation emissions, and reduce water consumption. This section describes the individual reduction measures, both voluntary and mandatory , and their anticipated avoided GHG emissions. For the energy, transportation, water, and waste sectors, initial and programmatic costs associated with the implementation of each measure, as well as the estimated cost-per-ton and payback periods in the building energy sector, are also provided. Data sources and key assumptions made in calculating the expected costs and avoided GHG emissions in 2020 can be found in Appendix C.

It should be noted that the measures are usually quantified by estimating the net effect in 2020 on reducing GHG emissions and focus on the actions that can be taken from 2014 to 2020 to result in reductions. However, as the base year is 2005 and the base year was used to project the 2020 business-as-usual forecasted emissions, the City can take credit for improvements in energy efficiency, use of renewable energy, transportation actions, waste reduction, and water conservation

that occurred after 2005. Actions that have already been taken will show their effect in future inventories by reducing overall GHG emissions. Thus, where a measure below, such as Energy-3, assumes a certain amount of residential retrofits by 2020, this would include all retrofits that would occur between 2005 and 2020. As such, through voluntary actions by residents and businesses in Stockton, as well as through local actions, such as the Green Building Ordinance or the Green-Up Stockton Ordinance, the City has already been implementing some of the necessary actions to achieve its 2020 reduction goal.

Many of the reduction measures described in this section would result in financial, environmental, health, and other benefits for the City, its residents and businesses. These benefits include cost savings over conventional activities, reductions in criteria pollutants, job growth, economic growth, and public health improvements. Expected benefits are described by emissions sector in this chapter. These benefits would be achieved in addition to the benefits gained from implementation of state measures, which include, but are not limited to, increases in gross state product, per capita income, and jobs.

Some of the measures shown below would occur with or without adoption of the CAP. Where this applies it is noted in text and the costs and savings are not credited as due to the potential adoption of the CAP.

The City's CAP includes several actions for which GHG reductions cannot be quantified separately, but would likely result in GHG savings. These strategies directly support implementation of the reduction measures presented below by creating education programs, securing funding, and/or developing policies and guidelines. Chapter 4 identifies supporting actions that the City might undertake to facilitate implementation of the CAP. Funding sources and approaches for different measures are also discussed in Chapter 4.

3.6.3 Development Review Process

Introduction

The City's Development Review Process (DRP) would provide a streamlined and flexible program for new projects to reduce their emissions. The DRP would include performance standards for new private developments as part of the discretionary approval process under CEQA. Under the DRP, new projects would be required to quantify project-generated GHG emissions and adopt feasible reduction measures to reduce project emissions to a level which is 29% below BAU project emissions. The DPR does not require project applicants implement a pre-determined set of measures. Rather, project applicants are encouraged to choose the most appropriate measures for achieving the 29% reduction goal, while taking into consideration cost, environmental or economic benefits, schedule, and other project requirements.

Performance Standard

The DRP performance standard is 29% below BAU project emissions for new discretionary projects. This reduction target was specifically selected to be consistent with San Joaquin Air Pollution Control District's recommended CEQA significance threshold and to require similar reductions for new development in Stockton as is likely to be required in other parts of the San Joaquin Valley. The City has already been using this threshold for review of project GHG emissions in the interim during CAP development.

Implementing the DRP

Implementation of the DRP would reduce GHG emissions attributable to new discretionary development projects at least 29% by 2020. Measurable reductions of GHG emissions would be achieved through the City's review and discretionary approval of residential, commercial, and industrial development projects. It is expected that project proponents would often include energy efficiency and alternative energy strategies to help reduce their project's GHG emissions because these are often the most cost-effective approach to reducing GHG emissions but are free to propose any valid measures that would achieve the overall reduction goal.

In order to meet this 29% goal, state measures and local mandatory measures (see Section 3.4.4) were quantified for new development. These measures achieve approximately 25% reduction (approximately 23% from state measures and 2% from local measures) in estimated new development emissions by 2020. The DRP results in an additional 4% of project emissions reductions that must be achieved by new development. The reduction amounts for each individual project from state or other local measures would vary and may be higher or lower than 25%; however, state and local mandatory measures are still expected to result in the largest share of the burden in meeting the 29% reduction target.

The City has already developed guidance for project proponents to identify measures to meet the 29% reduction in the Climate Impact Study Process, which is included in Appendix F. The Climate Impact Study Process provides detailed guidance by which project proponents can select measures appropriate for their individual project. The Climate Impact Study Process also includes a point system that can allow a project proponent to estimate potential reductions early in project planning before completing a full estimate of project emissions. The cost analysis of measures in this document can help project proponents to generally identify the relative cost-effectiveness of different measures in different sectors. The Climate Impact Study Process is not a mandatory tool, as long as project proponents can adequately document their GHG emissions and that their proposed reduction measures, combined with state measures, would result in project reductions of 29% or more compared to an unmitigated condition. The City would provide additional details on the DRP program, including measure selection, quantification, and implementation, in guidance documents.

The City already requires discretionary projects, through the CEQA process, to identify its GHG emissions and to mitigate those emissions when feasible mitigation is available and there are no overriding circumstances. The City presently uses the 29% (actually 28.7%) reduction goal as a requirement under CEQA for discretionary projects. Project proponents will incur costs to implement measures to reduce their project's GHG emissions; cost savings will also be incurred by residents and buildings owner's where the measures implemented save on energy or water or VMT. Because CEQA will require adoption of feasible mitigation whether or not the City adopts a CAP, these costs and savings would not be a consequence of adoption of the CAP. As such, costs and savings are not accounted in Table 3-2 as additional costs due to the adoption of the CAP.

3.6.4 Reduction Measures by Emissions Sector



Building Energy Use Measures

Reduction measures to address GHG emissions from building energy use are separated into two categories: energy efficiency and renewable energy. Energy efficiency measures are intended to

promote efficient energy usage, whereas renewable energy measures are intend to change the carbon content of electricity. Energy consumption by the City's built environment will represent over 34% of community emissions in 2020. Reducing electricity usage and improving energy performance are therefore vital to the City's CAP.

Energy retrofits have upfront costs, but usually result in savings over the long-term. In this sector, private residents, businesses and the municipal government would incur costs to upgrade to energy efficient technologies but would also realize the resulting energy cost savings. Costs to the City would mainly be associated with staff time for development of the incentive programs as well as costs of retrofits to existing municipal buildings and upfront costs for building new City facilities.

The building energy measures would also result in other benefits for both small and large businesses, as well as households in the City. Reductions in electricity use and the generation of renewable energy from clean technologies (e.g., wind, solar) would contribute to regional criteria pollutant reductions. Less combustion of natural gas may also produce local air quality and public health benefits. Overall, reductions in energy consumption and expenditures would enhance the ability for homeowners and business to withstand unexpected surges in future energy costs. Energy retrofits would also improve home value and likely contribute to economic growth by providing new jobs within the community.

The City has identified the following six building energy measures, which when implemented together, would reduce GHG emissions by approximately 49,000 metric tons in 2020 emissions (Table 3-1).

Energy-1: Green Building Ordinance [M]

Title 24 was established in 1978. The mandate includes energy efficiency standards, which are periodically updated to account for new technologies, for residential and non-residential development. Simply meeting the current Title 24 Standards in 2020 would result in significant energy and GHG savings for the City because the state has regularly updated the Title 24 requirements since 2005 and plans to continue to update the Title 24 standards periodically in the future. All new development is required to meet Title 24 standards, and these reductions are quantified as part of the state measure.

Beyond the requirements of Title 24 (which only applies to new development and major renovations), the City's existing Green Building Ordinance requires that all building additions greater than 500 square feet for single-family detached residential homes and all building additions greater than 5,000 square feet for non-residential space for structures permitted before 2002 must meet or exceed 2008 Title 24 of the California Code of Regulations Standards for the total building space.

The existing ordinance is presently suspended while the City considers potential changes to the existing Green Building Ordinance. The revised ordinance will require City and CEC approval to be enacted. Accordingly, GHG reductions achieved by the City's Green Building Ordinance have not been quantified as part of this document. Potential emissions reductions (beyond Title 24 requirements), as well as costs and operational savings, associated with the revised Green Building Ordinance will be assessed following approval by the City and the CEC.

Energy-2: Outdoor Lighting Upgrades for Existing Development [V/City]

Lighting requires the production of electricity to power the lights, which represents an indirect source of GHG emissions. Different light fixtures have different efficacies; in other words, certain bulbs can utilize less energy to obtain the same output. Replacing less-efficient bulbs with energy-efficient ones therefore reduces energy consumption, and thus GHG emissions.

This measure has two parts: Energy-2a (Municipal Outdoor Lighting Upgrades; and Energy-2b (Private Outdoor Lighting Upgrades).

Community infrastructure, including streetlights and traffic signals, consumes a significant amount of energy. The City has already begun replacing traffic signals with light-emitting diode (LED) bulbs, and expects all signals within City limits to be upgraded by 2020. Through implementation of Energy-2a, the City would expand its programs to replace 50% of streetlights with LED bulbs. Achieving this goal would reduce GHG emissions by 496 MT CO_2e. Total capital costs to the City to replace traffic signals and streetlights are estimated at $3.5–$8.1 million, with an estimated payback period of about 5–13 years. Annual cost savings to the City (including both reduced maintenance needs and energy cost savings) are estimated at about $0.6–$0.7 million.

In 2012, the City will have approximately 100,770 housing units and 81.0 million square feet of commercial and industrial floor space. Part of this measure (Energy-2b) includes a voluntary program to encourage and promote lighting upgrades for the private sector and other public agencies. The City would work with community services agencies and PG&E and other funding sources to identify funding and incentivize residential energy efficient lighting projects. If a quarter of existing buildings replaced 75% of lighting fixtures with energy-efficient bulbs between 2005 and 2020, the City would reduce GHG emissions by 1,702 MT CO_2e. Total initial costs to private building owners are estimated to range from about $4.3–$5.7 million, resulting in a payback period of about 2–3 years. Programmatic costs to the City are expected to be low, primarily associated with staff development of the voluntary incentive program.

Energy-3: Energy Efficiency Incentives and Programs to Promote Retrofits for Existing Residential Buildings [V]

Existing buildings generate a considerable amount of GHG emissions through energy consumption. Older developments are typically less energy efficient and therefore consume greater amounts of electricity and natural gas, relative to newly constructed facilities. Conducting home energy audits can help homeowners identify energy retrofits that would improve energy efficiency and save money.

In March, 2011, the City adopted the Green-Up Stockton Ordinance (Ordinance 005-11 C.S.) which encourages voluntary residential energy efficiency assessment and retrofits for existing dwelling units. The ordinance applies to units permitted prior to November 1, 2002 (excluding unconditioned space) and has a goal of 1,500 retrofits in 2011, 3,000 retrofits in 2012, and 4,000 retrofits in 2013, for a total of 8,500 retrofits by the end of 2013. Based on the best available data and a specific interpretation of language written in the Ordinance, the goals of the Green-Up Stockton program have been met. Overall, between 11,500 and 12,300 retrofits were implemented (depending on retrofit definition) under PG&E programs between 2011 and 2013. The ordinance's goal is an average reduction in energy use of 25% for the retrofitted units.

After the initial three years, the ordinance establishes a goal of retrofit of 4.5% of remaining units in

2014 and every year thereafter. If the 4.5% retrofit goal is not met, all applicable units would be required to have an energy assessment completed as outlined by the California Energy Commission's (CEC) Home Energy Rating System II (HERS II). The energy assessment is required to be performed by a CEC-certified home energy auditor, by a Building Performance Institute–certified analyst, or by another means deemed acceptable by the City of Stockton. This requirement would be triggered at a time and by criteria deemed appropriate by the City Council.

To quantify the effect of the Green-Up Ordinance and voluntary incentives and promotion of retrofits, it was assumed that, between 2005 and 2020, 15% of existing homes (approximately 15,000 units) would actually perform an energy audit, and of these, half would perform basic retrofits[27], 40% would perform advanced retrofits[28], and 10% would perform premium retrofits[29]. If these retrofit rates were achieved, GHG emissions could be reduced by 20,182 MT CO_2e in 2020.

Under this measure, the City would continue to work with community services agencies and PG&E and other funding sources to identify funding and incentivize residential energy efficiency projects.

The retrofit cost per home is estimated at about $900–$6,400, depending on the extent of retrofitting conducted, resulting in total initial costs to homeowners of $24 –$51 million. These retrofits are expected to result in energy cost savings that are in the interest of the homeowner and can deliver a payback period of 4–9 years. The cost of these retrofits can be financed through typical means, such as home equity loans. Incentives and rebates to reduce initial costs are also available through various programs and entities, including Energy Upgrade California, PG&E, and the federal government. With rebates and incentives included, the payback period could decrease to 1–4 years.

Implementation costs to the City to develop a program to encourage homeowners to implement these energy efficiency retrofits would depend on the scope of the program, and could be shared with a commercial retrofit program (as envisioned in the Energy-4 measure). The City also recently approved the city joining with more than 140 California jurisdictions in adoption the Home Energy Retrofit Opportunity (HERO) program which provides Property Assessed Clean Energy (PACE) financing. The HERO program allows property owners to obtain long-term competitive financing through an additional property assessment and can be used for both energy-efficiency retrofits as well as solar panels and electric vehicle charging stations.

Energy-4: Energy Efficiency Programs to Promote Retrofits for Existing Non-Residential Buildings [V]

Existing non-residential buildings represent more than 45% of the City's electrical demand. This measure assumes that, between 2005 and 2020, 15% of existing non-residential buildings would be retrofitted to improve energy efficiency by 20%. If this were to be achieved, GHG emissions would be reduced by 10,227 MT CO_2e in 2020. There are a number of initiatives the City can undertake to support business owners in achieving this goal, including energy campaigns and efficiency tune-up services. PG&E also offers rebates and incentives to commercial customers to encourage energy efficiency upgrades. AB 811 allows for the creation of property-based financing districts for energy

[27] Using compact fluorescent lamps (CFLs) for interior lighting; sealing air leaks.

[28] Using CFLs for interior lighting; sealing air leaks and ducts; installing a programmable thermostat; installing double-pane windows.

[29] Using CFLs for interior lighting; sealing air leaks and ducts; installing a programmable thermostat; installing double-pane windows; insulating attics; switching from electric to gas clothes dryer; installing an ENERGY STAR–qualified gas furnace.

efficiency, in which upfront funding is provided and then paid back through property assessments over time.[30]

Total initial costs to retrofit existing non-residential buildings for a 5%–20% energy efficiency improvement are estimated at $4.2 million–$6.4 million, including the cost of energy audits. These retrofits are expected to result in significant energy cost savings for non-residential buildings, with a payback period of 1–2 years. Incentives and rebates available through PG&E and other entities can further reduce this payback period. Implementation costs to the City to develop a program to encourage building owners to implement energy efficiency retrofits could be shared with a residential program, as discussed above. In 2013, the Stockton City Council approved FigTree Financing as a PACE provider focusing primarily on commercial PACE projects, to offer its services to businesses in Stockton.

Energy-5: Solar-Powered Parking [V]

The City's development code requires that multi-family housing units and commercial developments provide a minimum amount of parking for residents and customers. Covered parking required for multi-family residential is ideal for solar installations because it is flat and would otherwise be unused. Through Energy-5, the City would support programs to encourage existing multi-family housing complexes and commercial development to install solar panels on carports. The City's target is to achieve a participation rate of 15% of existing development (this rate would include any existing solar parking installed after 2005), which would reduce GHG emissions by 1,586 MT CO_2e.

Two different scenarios were developed for the cost analysis: (1) an owner-financed scenarios (with a 30-year lifetime) where the initial cost of the project is paid in cash (0% financing), (2) a Power-Purchase Agreement (PPA) scenario (with a 25-year lifetime) in which the initial costs are paid by a solar provider and the solar provider and the building owner share in the operational savings over time. These financing scenarios represent the bounds of the cost estimate range.

Total upfront costs to building developers/owners for the owner-financed scenarios to install solar panels on carports are estimated to be $38 million, depending on financing terms. Upfront costs for the PPA scenario are assumed to be borne by the solar provider at no cost to the building owner. Residential projects are eligible for the California Capacity-Based Incentive (CBI) and both residential and commercial projects are eligible for an federal income tax credit of 30% applicable to initial costs, which results in federal tax savings.

Annual energy savings are estimated as approximately $430 per project in 2020 with annual operating costs of approximately $41 per project in 2020.

Under the owner-financed scenario, these solar installations are expected to have a payback period of 17 year for residential projects and 13 years for commercial projects. Cost-per-ton overall for this measure under the owner-financed scenario is estimated as $10/MT$CO_2$e.

For the PPA scenario, costs/savings presented in this study are from the perspective of the building owner and thus payback for the PPA scenario are nearly immediate, given that PPA arrangements usually result in lower power costs from the initiation. Cost-per-ton (from the building owner-perspective) is estimated to be $-349/MT$CO_2$e.

As noted above, PACE financing is also available in Stockton as another financing approach for solar

[30] The constraints from Fannie Mae/Freddie Mac do not apply to commercial mortgages.

panels.

Energy-6: Residential and Non-Residential Rooftop Solar[V]

The City would encourage businesses and residents to install rooftop solar using Power Purchase Agreements and other low or zero up-front cost options for installing solar photovoltaic systems. When properly incentivized, rooftop solar can be installed in the City with little or no up-front investments, and can significantly reduce costs associated with electricity use for the business owner or homeowner. If 10% of existing commercial electricity use and 5% of existing residential electricity use were provided entirely by solar electricity, GHG emissions would be reduced by 15,078 MT CO_2e in 2020. This measure would include any existing residential or non-residential solar retrofits that are installed between 2005 and 2020.

Two different scenarios were developed for the cost analysis: (1) An owner-financed scenario (with a 30-year lifetime) where the initial cost of the project is paid in cash (0% financing) and (2) a Power-Purchase Agreement (PPA) scenario (with a 25-year lifetime) in which the initial costs are paid by a solar provider and the solar provider and the building owner share in the operational savings over time. These financing scenarios represent the bounds of the cost estimate range.

For the owner-financed scenario, total upfront capital costs for residential building owners associated with this strategy are estimated as $111 million and for commercial building owners are estimated as $209 million. Upfront costs for the PPA scenario are assumed to be borne by the solar provider at no cost to the building owner.

Residential projects are eligible for the California Capacity-Based incentive (CBI) incentive and residential and commercial projects are eligible for a federal income tax credit of 30% of the initial costs, which results in federal tax savings as well.

For residential projects in 2020, energy cost savings are estimated as approximately $1,300 reduced by the annual operating costs, of approximately $120. For commercial projects in 2020, energy cost savings are estimated as approximately $60,000 reduced by the annual operating costs, of approximately $30,000.

Under the owner-financed scenarios, these solar installations are expected to have a payback period of 17 years for residential projects and 20 years for commercial projects. Cost-per-ton for this measure is estimated as $60/$MTCO_2e$ for the lifetime of the measure under the owner-financed scenario indicating a net cost.

For the PPA scenario, costs/savings presented in this study are from the perspective of the building owner and thus payback for the PPA scenario are nearly immediate, given that PPA arrangements usually result in lower power costs from the initiation. Cost-per-ton (from the building owner-perspective) is estimated to be $-208/$MTCO_2e$.

As noted above, PACE financing is also available in Stockton as another financing approach for solar panels.

Land Use and Transportation Measures

The total vehicle miles traveled (VMT) by residents and employees of Stockton is expected to increase by the year 2020 as new housing units are developed and new jobs are created. As shown

in Table 2-1, the transportation sector will represent the largest source of GHG emissions in the City's future community GHG inventory. As a result, transportation-related reduction measures need to be a part of reducing the City's overall GHG emissions in 2020. It is important to note that the measures outlined below would also contribute to significant reductions in GHG emissions beyond 2020 as they would create a transportation and land use network that supports mixed-use, high density development, and alternative modes of transportation.

Land use and transportation measures can achieve significant benefits for individual residents and the community as a whole. Reductions in VMT and traffic congestion would reduce smog-forming emissions, toxic air contaminants, and diesel particulate matter (California Air Resources Board 2008). Alternative modes of transportation, such as bicycling, walking, and transit, may also help reduce many serious health risks associated with vehicle exhaust. Community well-being and quality of life may also be improved as individuals spend less time commuting, waiting for the bus, and/or sitting in heavy congestion.

The City has identified the following seven transportation measures, which when implemented together, would reduce GHG emissions by 13,619 to 19,360 MT CO_2e (Table 3-1). By 2020, these measures would result in a reduction in VMT, compared to 2020 BAU conditions, of over 33 million miles. With plan implementation, VMT growth between 2005 and 2020 would be approximately 9% compared to population growth of approximately 11%, which would meet the Settlement Agreement requirements.

Trans-1: Land Use/Transportation System Design Integration [City, V]

Research has found a link between density and travel behavior; when destinations are close together people are more likely to take modes other than private vehicles. Likewise, positive pedestrian design leads to fewer vehicle trips as mixed use development has the potential to reduce vehicle usage by providing adjacent services that can be accessed by walking.

The Settlement Agreement requires Stockton to locate at least 4,400 new housing units in the Greater Downtown[31], with 3,000 units approved by 2020. As discussed in Chapter 1, the Settlement Agreement was drafted prior to the economic downturn. Growth in the City has slowed dramatically and it is anticipated that only 3,900 new units will be constructed citywide between 2012 and 2020.[32]

Historically, development in the Greater Downtown area has been a very small part of residential growth in the City. From 2002 to 2011, approximately 14,085 new units were built City-wide, of which only 256 new units (1.8% of the overall) were in the Greater Downtown area. Taking into account demolitions, there were 13,444 net new units city-wide of which only 62 net new units (0.5%) were in the Greater Downtown area.

If 3,000 units were actually approved in the Greater Downtown area by 2020, this would be 77% of the expected new units from 2012-2020. In light of the history of downtown residential

[31] The Settlement Agreement defines the "Greater Downtown" as "land generally boarded by Harding Way, Charter Way (MLK), Pershing Avenue, and Wilson Way."

[32] At the time of the Settlement Agreement in 2008, using the General Plan forecasts one would expect approximately 50,000 housing units between 2005 and 2020. Using the revised City growth projections assumed in the CAP, which take into account the deep economic downturn, especially in housing, the City now only expects perhaps 9,300 units between 2005 and 2020, of which almost 60% of these units are already built (most were built prior to the effective date of the Settlement Agreement).

development, the economic downturn and the recent elimination of redevelopment agency funding by the state of California (eliminating a key financing tool to support downtown infill), achieving the 3,000 unit goal will be a challenging task.

The City is preparing General Plan amendments (separate from the CAP) to increase incentives for the development of housing in the Greater Downtown Area beyond the level of development forecast in the General Plan to meet these goals. General Plan amendments would include changes in density and allowed housing uses in zoning districts in the Greater Downtown Area as well as other changes in policies to encourage reuse of existing underused structures in the Greater Downtown Area for housing. These could include:

- support for a private-public partnership;
- flexible standards (e.g. form-based code);
- streamlined review process;
- establish a new Downtown Mixed Use Zoning District that would eliminate requirements for use permits for high density housing in the Downtown Core area (currently designated Commercial, Downtown Zoning District) and establish minimum residential densities in the areas currently zoned Commercial, Downtown and Commercial, General in the Downtown Core area.

Potential development of a private-public partnership for downtown revitalization is discussed further on pages ES-17 and 4-2 of this plan. Another key aspect of implementing Trans-1 would be the development of a new Greater Downtown Stockton Area Specific Plan to include all of the state and city requirements for specific planning including infrastructure studies and financial analysis. In addition, the City is considering playing a role in facilitating several demonstration projects in the downtown area to help launch and motivate downtown residential development including the following potential projects:

- *Cabral Station Neighborhood Transit Oriented Development (TOD) Concept*. This concept includes the following potential features;
    - Housing - Housing Mix: Market Rate Low-Rise, Mid-Rise, Townhomes, Live/work
    - Minimum Density: 20 dwelling units per acre/ Preferred Density: 25-30 d/u per acre
    - Minimum Floor Area Ratio (FAR): 2.0 / Preferred FAR: 3.0 to 4.0
    - General Location: Within ¼ mile radius west of the Cabral Station
    - Retail/Office/Flexible Use Space and Structured Parking:
        - Up to 38,000 square feet of retail/office/flexible use space on the ground floor.
        - Parking structure: approximately 340 spaces (floors 2 through 4). A proposed solar array could provide the majority of the electricity needed to operate the parking garage and ground floor retail (estimate 1,800 kwh).
    - Potential Commercial Uses Include:
        - Neighborhood Grocery Store - 14,000 sq. ft +/-
        - Child Care—8,000 sq. ft. +/-
        - Restaurant /Café 6,000 sq. ft. +/-
        - Office—10,000 sq. ft. +/-

- Needed General Plan and Zoning Changes to Facilitate TOD: The City of Stockton in partnership with the San Joaquin Regional Rail Commission (SJRRC) could initiate changes to the Industrial General Plan designation, and IL - Industrial Limited zoning to allow land use flexibility within the TOD land use concept. The City and SJRRC will explore Development Code changes allowing high density residential uses by-right, without need for a Use Permit.

- *Renaissance Mixed Use Demonstration Project Concept*: The Renaissance Project concept is of an energy efficient, sustainable, mixed-use infill development that will span two city blocks, consisting of two, five story buildings. This concept development will provide 130 market rate apartment homes (floors 2-5) above 6,000 square feet of ground floor retail space. The project's residential product mix is anticipated to be studio, one bedroom, and two bedroom apartments. The street (ROW) will be abandoned between the two blocks containing the project. Each of the two buildings will front onto Miner Avenue and will be built to the street property line. Site Information:
  - General Location: Miner Avenue corridor between Sutter Street and Grant Street
  - Gross Project Area: 4.6 acres
  - Dwelling Units Per Gross Acre: 28

In addition, the City will seek to promote greater land use diversity in Stockton by requiring a balance of jobs and housing in all new village areas and throughout the City as part of new development in accordance with General Plan policies (including ED-2.7, which emphasizes maintaining a jobs-to-housing ratio of greater than 1). By encouraging a diversity of uses to be provided, this will minimize the need for vehicle travel for basic needs (Fehr & Peers 2011a).

Achieving the goal of 3,000 units by 2020 and promoting greater land use diversity throughout Stockton is expected to decrease daily VMT by approximately 76,000 miles. This would equate to 7,181 MT CO_2e reduction in GHG emissions by 2020. Additional GHG reductions and transportation benefits are expected after 2020 with the integration of additional new housing units within the Greater Downtown and with continued emphasis on promoting a diversity of land uses.

Because the 3,000 unit goal is ambitious and will require creative incentives, streamlining of planning and a substantial shift in the market favorability of residential development downtown, the analysis in the CAP also examined the potential implications if a much lower amount of residential growth were to actually occur. For example, if only 10% of the 3,000 unit goal were achieved by 2020 (300 net new units, which would represent approximately a 5-fold increase over the 62 net new units added in the Greater Downtown 2002 to 2011), then this measure would only achieve reduction of daily VMT by 15,000 miles and reduction of 1,440 MT CO_2e of greenhouse gas emissions. Thus, for the purpose of the CAP analysis only, a range of reductions (1,440 to 7,181 MT CO_2e) have been included. The inclusion of the range does not change the goal of 3,000 units or the City's commitment to take reasonable and feasible efforts to support a substantial increase in downtown residential development.

This measure may result in costs and savings that are not readily quantified, including changes in trip costs, and sales or property taxes. Relative to the downtown infill program, upfront costs to building developers/owners would depend on the cost differential between downtown development and outlying development. Costs may be negative or positive depending on site development, building rehabilitation, site cleanup, and infrastructure costs. Residents may

experience a maximum annual cost savings of $12 million from reduced VMT ($2.4 million in the case of the more limited downtown analytical assumption of 300 units); however, additional costs for substitute modes of transportation (e.g., bus fares) may offset these savings.

There will also be costs for promoting a diversity of land uses in new village areas and other parts of the City, including the development costs of neighborhood commercial development along with new residential development. However, similar to downtown infill, residents would be expected to experience savings from reduced VMT.

Costs to the City may include the cost of writing updates to development codes and any public development construction costs, if applicable. A range of cost savings exist, depending on the City's approach to increasing density of residential development. For example, some cost savings in the provision of public services, such as creating and maintaining roads and utility lines, may be achieved. Potential costs for increased transit service by RTD were not estimated separately for this measure because they are assumed to be included in the costs estimated for the Transit Plan (see the discussion under Trans-6 and Appendix D). The City would also seek to utilize federal, state, and regionally available grant funding to leverage private investment to help defray costs.

Trans-2: Parking Policies [M]

Parking attributes, such as price, location, and availability, can influence parking behavior. Some people are willing to walk longer distances to get free parking, while others may choose to ride transit in an area with high parking prices and limited parking availability. Likewise, employees may opt to take transit instead of driving if they can receive financial incentives for doing so. Most of the parking supply within the City, outside of the downtown area, is free.

At present, the City does not require the provision of parking by new development in the Central Parking district. The City would encourage the development of policies that increase parking costs by 10% in the downtown area (metered parking fees have already increased by at least 10% since 2005). Other strategies to achieve the goal include designating the most attractive spots for rideshare vehicles and offering incentives for employees not to park. If parking strategies were instituted in the City, daily VMT would be reduced by approximately 16,570 miles and a total of 1,557 MT CO_2e of GHG would be avoided by 2020.

The City would have some limited program upfront development costs and costs for new signage/meters, as shown in Table 3-3. Additional parking enforcement costs would be incurred by the police department, but revenues earned through increased parking prices and signs should offset program operational costs. Potential costs for increased transit service by RTD were not estimated separately for this measure as they are assumed to be included in the costs estimated for the Transit Plan (see the discussion under Trans-6 and Appendix D).

Residents might expect maximum annual cost savings of $2.6 million from reduced VMT; however, additional costs for substitute modes of transportation (e.g., bus fares) may offset these savings.

Trans-3: Transit System Support [City, V]

Although the City of Stockton is not a transit provider, the City can encourage the development of transit amenities. Transit amenities include the following:

- Signal priority (i.e., signal changes to enable fluid transit movement) at intersections.

- Bus shelters.
- Park-and-ride facilities.

Fehr & Peers estimates that the provision of transit support facilities could reduce daily VMT by 13,532 miles. The City would work also with the San Joaquin Regional Transit District (RTD) to enhance the existing and future transit system as part of Trans-6. Anticipated GHG reductions associated with this measure total 1,272 MT CO_2e.

Expanding the existing park-and-ride system by an additional 200 parking spaces could cost the City about $500,000 in initial construction costs. Additional costs would be associated with the development of signal priority and bus shelters. Potential costs for increased transit service by RTD were not estimated separately for this measure because they are assumed to be included in the costs estimated for the Transit Plan (see the discussion under Trans-6 and Appendix D).

Residents may experience a maximum annual cost savings of approximately $6 million from reduced VMT; however, additional costs for substitute modes of transportation (e.g., bus fares) may offset these savings.

Trans-4: Efficient Goods Movement [City]

There are a number of at-grade railroad crossings throughout the City. These at-grade crossings contribute to vehicle delay, especially when long freight trains pass through the crossings. Providing grade-separated crossings where rail lines and roadways intersect can reduce idling and traffic diversions. To improve the efficiency of goods movement through Stockton, the City is constructing grade-separated crossings on Eight Mile Road and Lower Sacramento Road, and planning for an additional grade separation along Sperry Road.[33] If the City were to make these roadway improvements, daily VMT would decrease by approximately 10,251 miles and citywide GHG emissions would be reduced by 767 MT CO_2e in 2020.

Grade separation projects have substantial upfront construction costs, but these projects are already planned and separately funded, and as such would not result in additional incurred costs if the CAP were adopted and implemented. Residents and businesses would also experience savings from reduced VMT.

Trans-5: Reduce Barriers for Non-Motorized Travel [City]

In 2007, the City of Stockton completed a Bicycle Master Plan which identified existing bicycle routes, bicycle usage, and future improvements to the bicycle system. This report also identified several major gaps in the City's bicycle network including the need for additional connections to major destinations. It is anticipated that the addition of these bicycle facilities would encourage additional bicycle commuting, as well as bicycling for other trip purposes, such as for shopping or personal business.

Implementing policies to support multi-modal streets, or complete streets, would also encourage transit, walking, and bicycle trips. The City developed Multi Modal Street Design Guidelines in 2011

[33] Grade separations on Airport Way and French Camp Road are planned to be constructed when these roadways are widened to accommodate approved and pending projects in the area, although currently there is no schedule for their construction.

to support and integrate Stockton's land use and mobility needs. The design standards provide design concepts for vehicles, pedestrian, bicycle, transit, and alternative intersection design. Implementation of these supportive polices would encourage residents to make shorter trips using alternative modes of transportation.

Overall, with the progressive implementation of the City's Bicycle Master Plan over time, the provision of additional bicycle and pedestrian facilities and implementation of the Multi Modal Street Design Guidelines is expected to reduce daily VMT in 2020 by approximately 15,520 miles and GHG emissions by 1,459 MT CO_2e.

Based on Stockton's Bicycle Master Plan, construction costs can vary on a per-mile basis, depending on the type of bikeway facility constructed. Constructing a total of 18 miles of bikeway (2 miles per year from 2014–2020) could cost the City approximately $1.4–$11 million, assuming either Class I or II facilities. Annual maintenance costs could reach $90,000–$180,000 per year by 2020. Funding sources are discussed in Chapter 4. The initial capital costs are relatively high due to the capital intensive nature of constructing and improving bike paths, bicycle stations, and the provision of bike racks on buses and other locations. Additional costs would also be incurred for bicycle storage and shower facilities, multi-modal street design guidelines, and the purchase and maintenance of bicycles and associated equipment. The City would also incur limited costs for staff time to amend the City Zoning Code and to conduct planning and project administration. Bicyclists might expect annual cost savings of up to $2.4 million from reduced VMT.

Trans-6: Transit System Improvements [City/RTD]

The City developed a Transit Plan (Appendix D) to identify service improvements and enhancements that could be implemented to increase ridership. Strategies outlined in the plan include provision of additional bus rapid transit routes, realignment of existing and planned routes, and improved transit service. As discussed in the Transit Plan, RTD will face challenges in increasing service over time to just keep the City's current transit mode share at the current level of 3%, in light of predicted population growth. Given these financial constraints, it is considered unlikely that the combination of RTD actions as supporting actions implemented by the City that are included in the Transit Plan will result in any substantial improvement in the transit mode share.

This does not mean that the efforts of RTD or the City will have no effect. However, given funding limitations, at this time, the best that can be expected from RTD and City efforts is that the City will keep its current transit mode share, as opposed to experiencing a decline in transit mode share. Transit ridership would, however, increase with population over current levels.

As described in the Transit Plan, RTD would need an additional annual operating budget of $8.3 million above 2011 budget levels to keep the current transit mode share. Additional service improvements in the Transit Plan would include $2.5 million in upfront capital costs, including the purchase of buses to support expansion of service, as well as $2.9 million in incremental annual transit operating costs. Depending on the strategies implemented, some of these costs could be borne by private developers. Funding sources are discussed in Chapter 4.

Trans-7: Safe Routes to School [City]

Since the 1960s, the percentage of school-aged children walking or bicycling to school has decreased from 42% to 16%. Reasons for this drop have included an increase in distance to schools, traffic-related safety concerns, concerns about crime, and conflicting school policies. To address this issue

and promote walking and cycling to school, many local jurisdictions are developing Safe Routes to School (SRTS) programs. Through implementation of Trans-7, the City would work with local school districts to enhance pedestrian crossings, encourage activities such as a *walking school bus*, and create educational programs that teach students bicycle safety. It is anticipated that such programs could decrease daily VMT by approximately 21,132 miles and reduce GHG emissions by 1,986 MT CO_2e. This measure would include the effect of any safe routes implemented between 2005 and 2020.

Assuming 20 projects are undertaken at a cost of about $200,000 to more than $500,000 each, total costs to the City could range from about $4 million–$11 million, with additional budget (estimated at $50,000 per year) required for planning. These costs could be offset through funds from the federal-aid state SRTS program. Resident walkers and bicyclists might expect maximum annual cost savings of $3.3 million from reduced VMT.

Trans-8: Transportation Demand Management and Additional Safe Routes to School [City, V]

There are numerous modifications to travel behavior that the average citizen can undertake that could result in large VMT reductions. Small changes to daily travel routines, such as walking children to school one day a week, working from home one day a month and/or using an alternative mode of transportation, such as biking, transit or carpooling, to work one day at month could result in significant reductions should a large enough proportion of the population alter their travel behavior.

This measure includes two parts: Trans-8a would include additional SRTS (like Trans-7, but more); Trans-8b would include a voluntary transportation demand management (TDM) program for large employers. This measure would include the effect of any additional SRTS or TDM programs implemented between 2005 and 2020.

The City would work with local school districts to expand the SRTS Program (Trans-7) to achieve a participation rate of 10% of K-12 students. It is anticipated that such programs could decrease daily VMT by approximately 21,132 miles and reduce GHG emissions by 1,986 MT CO_2e.

Likewise, the City would encourage employers within the City to take actions that would result in at least 1% of employee participate in a Transportation Demand Management Program. It is anticipated that such programs could decrease daily VMT by approximately 33,536 miles and reduce GHG emissions by 3,152 MT CO_2e.

In total, this measure could decrease daily VMT by approximately 54,668 miles and reduce GHG emissions by 5,138 MT CO_2e.

Costs associated with this measure might include additional capital improvement project costs for school projects—similar to those estimated for Trans-7 above—as well as program administration and implementation costs for a travel demand reduction program.



Waste Generation Measures

Each year, City residents and businesses generate more than 700,000 tons of waste. Stockton has a comprehensive collection system that is designed to reduce the amount of trash that is eventually sent to regional landfills. The City's programs have been successful; diverting more than 64% of all

waste generated in 2005 to recycling centers and other end uses. To further reduce the amount of waste sent to regional landfills, the City has committed to an aggressive diversion strategy.

In addition to GHG emissions and cost savings, diversion programs may reduce waste-hauling and tipping fees, as well as fuel combustion emissions for transporting waste to landfills. Likewise, reductions in landfilled waste would reduce the need for landfill space, which may contribute to future land conservation. Increased recycling and reuse would reduce the need for raw material and energy manufacturing, thereby contributing fuel savings and criteria pollutant reductions.

Waste-1: Increased Waste Diversion [M]

Residents and businesses play a vital role in making Stockton's collection system a success by collecting recyclable materials, green waste, and food. The community's efforts have paid off: in 2005 the city avoided landfilling just under a half million tons of waste. Increased outreach to residential and commercial customers will optimize the participation in the recycling and diversion programs. Weekly single-stream recycling, green waste and food waste diversion, and a strong construction/demolition debris program enable Stockton to play an important role in meeting California's 75% diversion goal required by AB 341. By 2020, it would be the City's goal to achieve a 75% diversion rate, even though AB 341 does not require individual jurisdictions to achieve that rate. Achieving the 75% rate would reduce GHG emissions by 4,245 MT CO_2e in 2020 (Table 3-1).

Costs to the City would include enhanced promotional efforts through public education campaigns. For the purposes of this planning effort, it is assumed that the increase in diversion would come primarily from improved recycling efforts at multi-family housing units and areas where contamination of recyclables routinely occurs. Because the City is already engaged in outreach campaigns, the additional City costs are assumed to be limited.

For waste managers, there are both costs and savings associated with increasing waste diversion. Increased costs can be expected for collecting and processing recyclables, while revenues can be generated from the sale of recyclables and cost savings associated with avoided waste disposal. Assuming a net cost[34] of $69 per ton recycled, the annual cost of increased waste diversion is estimated in 2020 to be approximately $5.8 million in Stockton. These net costs would be borne primarily by Waste Management, although part or all of these costs could be passed on to customers.



Water Consumption Measures

The City's Municipal Utilities Department (COSMUD) is committed to conserving water and currently offers residents and businesses a number of rebates and incentives to reduce water use. Not only is water an important resource with limited supplies, but the treatment, distribution, and conveyance of water requires considerable amounts of electricity. The generation of this electricity consumes fossil fuels and releases GHGs. Reducing water demand and conserving water can therefore save energy and avoid future emissions.

The City has identified the following two strategies to enhance community-wide water and resource conservation. The two strategies would collectively reduce water consumption, which would likewise contribute to reductions in building energy use. For example, efficient faucets that use less water would require less electricity and natural gas for hot water heating. Additionally, energy required to transport, distribute, and treat water would be reduced. The consumption of less

[34] Net costs are inclusive of increased costs and new revenues generated.

electricity and natural gas would ultimately translate to reductions in region and local criteria pollutants, which may improve community health and well-being. Water measures that encourage building retrofits also have an additional benefits of enhancing building value and resale.

It is important to note that the water conservation measures would achieve reductions in the building energy sector. However, the emissions savings are reported as part of the water sector as they are a direct result of implementation of water conservation measures.

Water-1: Comply with Senate Bill X7-7 [M]

SB X7-7 was enacted in November 2009 and requires urban water agencies throughout California to increase conservation to achieve a statewide goal of a 20% reduction in urban per capita use by December 31, 2020 (20X2020 goal). The City's Urban Wastewater Management Plan establishes a 2020 urban water use target for the COSMUD[35] of 165 gallons per capita per day (City of Stockton 2011a).[36] The projected water use at the 2020 target is 18,693 million gallons, which is a 42% reduction in BAU water consumption, relative to existing (2005) conditions.

The City's urban water retailer plan to reach its 20X2020 goal is based on the continuation of best management practices (BMPs) and efficient water tracking. Achieving the 20X2020 goal would reduce GHG emissions by 9,680 MT CO_2e in 2020 (Table 3-2).

Since SB X7-7 is a state mandate, its costs and savings would not be a consequence of adoption of the CAP. As such, costs and savings are not accounted in Table 3-2 as additional costs due to the adoption of the CAP.

Upfront costs may be incurred associated with the construction of new water infrastructure, while cost savings may result from reduced treatment and conveyance costs for the City's urban water retailer, as well as reduced water bills for residents and businesses.

Water-2: Promotion of Water-Efficiency for Existing Development [V][37]

California homes and businesses consume a significant amount of water through indoor plumbing needs and outdoor irrigation. ConSol estimates that an average three-bedroom home uses 174,000 gallons of water each year (ConSol 2010). A large portion of water use can be attributed to inefficient fixtures (e.g., showerheads, toilets).

In 2010, the California Building Standards Commission adopted Title 24 Part 11 (also known as CALGREEN), the mandatory green building standards code and the first such code in the nation. CALGREEN requires all new buildings in the state to be more energy efficient and environmentally responsible. Although CALGREEN only applies to new development, renovating existing development to meet current codes is critical considering that flow rates for common plumbing fixtures were significantly higher in the 1980s and 1990s than they are today. For example,

[35] The City of Stockton is served by three urban water retailers; the City of Stockton Municipal Utilities Department, the California Water Service Company and San Joaquin County (Morales pers. comm.). Information from the California Water Service and San Joaquin County were unavailable. Consequently, the COSMUD 20X2020 goal was used as a proxy for the city's three urban water retailers.

[36] Represents the target under Method 3, which is the preferred calculation method for COSMUD.

[37] Emissions reductions associated with reduced electricity and natural gas for hot water heating will be achieved in the building energy sector. However, these emissions reductions are reported as part of Water-2 as they are a direct result of implementation of water-efficient fixtures.

residential clothes washers in 1992 had a flow rate of 15 gallons per cubic foot. ENERGY STAR–qualified washers today have a flow rate of 6 gallon per cubic foot—a 60% reduction in water use over older models.

With this measure, the City would actively encourage water efficiency and retrofit programs for existing developments. If those residents and commercial developments conducting energy audits and implementing energy retrofits (as part of Energy-3 and Energy-4) also installed water efficient appliances, plumbing fixtures, and graywater systems that met CALGREEN standards, the City would avoid 6,548 MT CO_2e of GHG emissions in 2020.

Total costs to private homeowners to replace existing plumbing fixtures with water-efficient ones are estimated at $12 million, with a payback period of about 8 years. Costs to the City are expected to be low, and include staff time to promote voluntary replacements in existing homes.



Wastewater Treatment Measures

Wastewater generated within the City is currently treated at the Regional Wastewater Control Facility (RWCF), which is owned and operated by the COSMUD. The RWCF treatment process is completed in four stages; the first three stages remove solids and the final stage disinfects effluent prior to discharge into the San Joaquin River. By 2020, over 12,000 million gallons of wastewater are expected to undergo this process at the RWCF (City of Stockton 2011a). Collection and treatment of the wastewater would generate fugitive methane emissions from organic decomposition, as well as GHGs from electricity consumption.

The City completed a Capital Improvement and Energy Management Plan (EMP) to identify actions and measures to enhance operations at the RWCF. Among those, the following measure has been selected by the City to improve energy efficiency. Benefits associated with this measure are reduced regional criteria pollutants from reduced electricity consumption.

Wastewater-1: Energy Efficiency Improvements at the Regional Wastewater Treatment Plant [City]

The EMP outlines the following seven actions that would achieve a 5.7% reduction in energy usage at the RWCF (City of Stockton 2011b).[38]

- Reduce Discharge Pressure of Tertiary Air Compressors.
- Install Premium Efficiency Motors on a Replacement Basis.
- Replace Existing HID Fixtures with High Efficiency Fluorescent Fixtures.
- Install Automatic Lighting Controls.
- Replace Air Compressor No. 2 with a VSD Air Compressor.
- Install Higher Efficiency DAF Pressurization Pumps.

[38] GHG emissions associated with electricity consumption at the RWCF were reported in the building energy sector of the GHG Inventory (only fugitive and process emissions were reported in the wastewater sector). Consequently, emissions reductions associated with reduced electricity use will be achieved in the building energy sector. However, these emissions reductions are reported as part of Wastewater-1 as they are a direct result of implementation of the EMP.

- Replace Existing Outdoor HID Lighting with LED Lighting.

Implementing the energy efficiency actions identified in the EMP would reduce GHG emissions by 312 MT CO_2e by 2020 (Table 3-1). After incentives and rebates, these actions would incur minimal upfront capital costs, $300,000, resulting in a payback period of just 2 years (City of Stockton 2011b).



Urban Forestry Measures

Urban forests are dynamic ecosystems within cities that provide environmental and aesthetic benefits. Trees help to clean the air and water, strengthen the quality of place, reduce storm water runoff, create walkable communities, and raise property values. Stockton's commitment to urban forestry is evident by the number of trees that currently line the streets. Existing tree planting programs have been successful through the support and partnership of residents throughout the community. The City plans to expand these programs through the following measure.

Urban Forestry-1: Urban Tree Planting Programs [City]

Trees sequester atmospheric CO_2 during respiration. The amount of CO_2 sequestered depends on the type, size, and age of the trees. Planting trees in downtown areas would also help reduce urban heat island effect with increased shade. The GHG benefits achieved from tree planting would vary based on the distance the tree is planted from the building; trees that are planted adjacent to buildings would achieve the most energy reductions. The City is not in a financial position to expand the number of street trees now or in the next few years. With this measure, the City would strive to expand its urban forestry programs to plant between 500 and 900 trees per year from 2016 to 2020. To maximize GHG and other environmental benefits, new trees would be targeted to the downtown and urban areas.

If the City begins planting in 2016, a total of 3,500 new trees would be planted in and around the City by 2020. These trees would reduce GHG emissions by 75 MT CO_2e, through active sequestration (Table 3-1) but would have increasing and far greater sequestration value for the years beyond 2020 as the trees mature.

The City would incur initial costs to plant, stake, and mulch a total of 3,500 trees, estimated at between $142 and $197 per tree. Annual maintenance costs are estimated to range from $43,000–$196,000, depending on the maturity of the tree (irrigation costs are higher in the first five years, whereas infrastructure repair and litigation/liability costs apply after the trees reach a certain size). Funding for this measure (and other measures implemented by the City) are discussed in Chapter 4. Total lifetime net savings per tree—including the value of benefits—are estimated at break-even for a small tree and about $1,400 for a medium tree.



High Global Warming Potential Greenhouse Gas Measures

Although emissions of High GWP GHGs are small in terms of the mass of gas emissions relative to the mass of other emissions sectors, they have a much greater effect on global warming on a pound per pound basis than other GHGs and persist in the atmosphere for thousands of years (Table 1-1). The primary sources of High GWP GHGs in the City are refrigeration and air conditioning unit. These equipment require the use of refrigerants and foam. Most refrigerants are classified as chemicals

known as HCFCs and PFCs and have GWPs that are often 100–1,000 times greater than CO_2. Proper disposal of appliances that contain refrigerants is critical for reducing long-term emissions of High GWP GHGs once units have been decommissioned. Benefits associated with this measure include a reduction in emissions of ozone-depleting substances.

High GWP GHG-1: Residential Responsible Appliance Disposal Programs [City]

EPA estimates that that over nine million refrigerators and freezers were disposed of in 2009. Federal law requires that all refrigerant be recovered and waste be properly managed and stored. However, the law does not require the recovery of appliance foam, which represents a source of High GWP GHG emissions. To address this issue, EPA began a voluntary program for responsible appliance disposal (RAD) in October 2006. RAD reduces emissions of high GWP GHGs through the recovery of appliance foam. The program also helps prevent the release of hazardous materials and recycles metals, plastics, and glass (U.S. Environmental Protection Agency 2010b).

There are three recycling centers in California that are certified to remove appliance foam; two owned and operated by JACO Environmental, Inc. in Fullerton and Hayward, and one owned and operated by Appliance Recycling Centers of America (ARCA), located in Compton. To help residents dispose of their freezers and refrigerators using RAD, with this measure, the City would require a vendor to establish a RAD drop-off center in Stockton. This center would be operated by a solid waste company under contract to the City. Decommissioned units would then be transported to the Hayward center for proper recycling.

Based on the age of existing refrigerators and air conditioning units in Stockton, as well as average replacement rates, it is anticipated that over 1,400 residential refrigerators and 250 freezers would be disposed of in 2020. If 15% of these units were recycled using RAD, approximately 255 MT CO_2e of GHG emissions would be reduced (Table 3-1). The City would actively encourage attainment of this goal.

There are initial capital construction costs to build or renovate a drop-off center, as well as ongoing staff and other operational costs to run the center. Additional transportation costs would also be incurred, although a quantitative estimate is not available.



Off-Road Activity Measures

Off-road equipment includes construction equipment and off-road vehicles. Direct emissions of GHG are generated by equipment fuel combustion. Industries that use off-road equipment within the City include the agricultural, construction, industrial, entertainment, rail yards and dredging sectors. In addition, recreational vehicles (e.g., all-terrain vehicles [ATVs]), pleasure craft (e.g., jet skis), and lawn and garden equipment (e.g., mowers) represents a source of off-road emissions.

The City has identified the following three measures to increase the use of alternative fuels in off-road equipment and reduce the consumption of fossil fuels. When implemented together, the measures would reduce GHG emissions by 2,622 MT CO_2e in 2020 emissions (Table 3-1). These measures would also achieve significant benefits for individuals and the community as a whole. For example, electrification of off-road equipment would reduce fossil fuel consumption, thereby contributing to reductions in smog-forming emissions, toxic air contaminants, and diesel particulate matter (California Air Resources Board 2008). Serious health risks associated with heavy-duty

vehicles may therefore be reduced, resulting in improvements in community health and well-being.

Off-Road-1: Electric-Powered Construction Equipment [V]

In 2020, the construction industry would generate approximately 25% of total off-road emissions within the City. Utilizing electric power instead of traditional fuels (e.g., gasoline and diesel) would offset direct GHG emissions from fuel combustion. Indirect emissions from electricity transmission are significantly lower than direct emissions from fuel combustion. Under this measure, the City would work with state and local partners to develop financial incentives for participating construction contractors to electrify portions of their fleet by 2020. If 3% of construction fleets could be electrified, the City would reduce GHG emissions by 1,427 MT CO_2e.[39]

Private businesses would incur initial costs to electrify their fleet, offset by financial incentives, as well as increased electricity costs; savings would result from reduced fuel usage. Costs to the City are expected to be low, primarily associated with promotion of existing financial incentives.

Off-Road-2: Reduced Idling Times for Construction Equipment [M]

Off-road equipment idles during rest periods, which requires fuel use and results in GHG emissions. Fuel consumption and idling times for off-road equipment would vary by type and model. However, it is estimated that on average, construction equipment idle for approximately 141 minutes, or 29% of an 8-hour work day.

CARB's Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling currently limits diesel-fueled commercial motor vehicle idling time to 5 minutes. This regulation does not apply to off-road equipment. The City would strive to develop an ordinance to limit heavy-duty off-road equipment idling time to meet CARB's idling regulations for on-road trucks would reduce idling time and GHG emissions by 920 MT CO_2e in 2020.

Private businesses would experience cost savings associated with avoided fuel use, reduction in maintenance costs, and engine overhauls; these savings may be offset to the extent that technologies to support idling reduction are adopted. Total upfront costs to install idling reduction technologies are estimated at $1.3–$15 million, or between $1,000 and $8,500 per unit. Costs to the City are expected to be low, primarily associated with staff time to write ordinances.

Off-Road-3: Electric Landscaping Equipment [V]

Growth in the use of lawn and garden equipment, such as mowers, trimmers, and blowers, is expected to increase, consistent with continued growth in the professional landscaping industry and by consumer-driven demand. Electric and battery powered products are anticipated to experience significant industry growth by 2020, both in part due to increased environmental awareness and ease of use (Wartgow 2011; Freedonia Group 2011). Switching to electric powered equipment also virtually eliminates GHG emissions and reduces air toxics from fuel combustion that can be harmful to human health.

With this measure, the City would adopt a goal for 15% of the City's landscaping equipment to be

[39] This program could be structured in different ways. Program approaches could vary from a low participation rate (15%) but high replacement rates (20%) which would result in electrification of 3% of the construction fleet to a high participation rate (50%) with lower replacement rate (5%) resulting in 2.5% replacement of the construction fleet. This measure assumes 3% of the construction fleet is electrified by 2020.

electric or battery powered by 2020. The city would promote this voluntary measure through partnership with the air district, CARB, and other parties to encourage equipment replacement overtime. Achieving this goal would reduce GHG emissions by 275 MT CO_2e. The City would incur capital costs to switch to electric-powered equipment, although a quantitative assessment is not available.

3.7 Carbon Offsets

An alternative approach to providing additional GHG reductions would be through the purchase of carbon offsets. A carbon offset is a credit derived from the reduction of GHG emissions through a separate reduction project, often in a different location from the location of the original GHG emissions that one intends to offset. There are a myriad of potential offset project types, but some of the most common types include forestation (planting of trees or management of forests to increase their carbon sequestration), methane gas digesters (to reduce methane from manure management), energy efficiency (to reduce electricity and natural gas emissions), renewable energy (to reduce electricity emissions), reduction of landfill methane, replacement of high global warming potential gases, such as hydrofluorocarbons (HFCs) with less harmful materials, and other measures.

At this time, purchase of carbon offsets is not included as a measure in this plan, primarily out of the concern of directing funding to offset projects outside Stockton that would have little potential economic return to businesses and residents in Stockton and would not result in economic multiplier effects within Stockton. The information below is thus only provided as background information.

Carbon offsets can be part of emissions trading schemes, such as the Regional Greenhouse Gas Initiation (RGGI) in the northeastern United States or the European Emissions Trading Scheme (ETS). Carbon offsets are usually validated through established protocols that certify that the offsets represent valid reduction of GHG emissions that can be used for compliance with emissions reduction mandates and treaties.

In order to be acceptable for credit under the AB 32 cap-and-trade program, GHG emission reductions must be real, permanent, quantifiable, verifiable, enforceable, and additional. The term "additional" essentially means that you cannot receive credit for any reductions that you were otherwise obligated to make or that would happen without your purchase of the offset. AB 32 requires that its implementing regulations include market-based compliance mechanisms to ensure that reductions are "in addition to any greenhouse gas emission reduction otherwise required by law or regulation, and any other greenhouse gas emission reduction that might otherwise occur" (CAPCOA 2010).

Key questions for the use of offsets that would need to be resolved would be:

- *What protocols shall be used to validate offsets?* There are a number of protocols that are presently being used. Among the more rigorous are the protocols from the Climate Action Reserve, the Gold Standard, the Voluntary Carbon Standard, and the Clean Development Mechanism in addition to the CARB protocols associated with the California cap and trade system. There have been questions and controversies about some offset systems due to questions about the transparency and rigor used to evaluate offset projects for this market.
- *Who should validate offsets?* The more rigorous protocols require third-party verification of

offset projects to ensure that validation of offset credits be done by neutral independent individuals or bodies.

- *Where should the offsets be from?* There are offset providers in California, in other parts of the United States, and other parts of the world. Offset fees can be an economic benefit to the offset provider. As a result, some people are of the opinion that offsets should only be in the local jurisdiction where the emissions are generated in order to keep funding and benefits local. Others argue for the use of offsets from as large geography as possible to incentivize competition and result in more low cost offset options.
- *Do offsets need to be in-kind or can they be out of kind?* Some people argue that offsets should only be allowed if they offset emissions in the same sector as the original emissions. For example, forestry offset might only be allowed to compensate for loss of forest. Others argue that, on a metric ton of carbon equivalent basis, all GHG emissions are equal in their effect on the radiative balance of the atmosphere, and that out of kind offsets should be acceptable as well so as to minimize offset costs.
- *What "vintage" should the offsets be*? Offsets are usually purchased in relation to a fixed year and are credits in the form of 1 metric ton of carbon for one year. The City would need to determine if offsets must be the same year as the emissions they compensate for or whether offsets can be purchased for prior or future years.
- *Should offsets be allowed at all*? Some parties argue that offsets should not be used to compensate for increased emissions because emission sources would not be encouraged to reduce their own emissions.

The price of offsets varies considerably based on the provider. In recent years, depending on the protocols used, whether the offsets are traded in a market system, the location of the offset project, the type of offset project, and market conditions, offsets using the more rigorous protocols have ranged roughly between $1 per metric ton to $30 per metric ton over time. The future price of carbon offsets will depend on how the burgeoning trading systems in California and elsewhere develop over time and on state and federal regulation of GHG emissions. The current range is approximately $1 per metric ton to $10 per metric ton.

It is important to note that if carbon offsets are purchased outside of Stockton (or the northern part of San Joaquin Valley near Stockton), there would be no local benefits. These benefits could include job growth or improved air quality for example. These benefits would otherwise accrue to Stockton for reduction activity that occurs within Stockton (or in the immediate vicinity).

Provided that offsets are validated pursuant to an acceptable and rigorous protocol, ideally by a neutral third party, Stockton could theoretically allow for the use of offset purchases by new development to meet part of its GHG reduction burden under CEQA. However, Stockton is not proposing to purchase offsets otherwise as part of this Draft CAP due to financial and cobenefit concerns.

3.8 Limitations and Recommendations for the Climate Action Plan

The CAP is the culmination of dedicated work by the City and the advice of the CAPAC to identify and

reduce community GHG emissions through feasible measures in light of their effectiveness, cost, and appropriateness for Stockton. The inventory was designed to capture all major emissions sources, identify data gaps, and make recommendations for future inventory updates (see Chapter 4). The inventory is based on acceptable methods for quantifying GHG emissions. Through future tracking of economic activity and data, future inventories may be able to quantify certain emissions areas at a more disaggregated level, which would allow more precise estimates of reduction potential for different reduction strategies. However, the current inventory is based on standard practice and provides sufficient detail for the City to quantify and monitor effective emission reduction measures.

The economic analysis associated with each measure is intended to provide an indicative range for the types of costs and savings that private residents and business and the City of Stockton could expect to incur as a consequence of GHG reduction measures. Actual costs and savings would vary depending on local conditions, year of implementation, changes in relative prices and utility rates, financing terms, and a variety of other factors.

The CAP serves as a starting point for future GHG inventories and ongoing GHG management. As discussed in Chapter 4, the City would develop a GHG monitoring and reporting program to support and track implementation of reduction measures. Therefore, the emissions inventory would likely include more sectors and widen in sophistication as methods improve and requisite data tracking becomes standard.

Chapter 4. Implementation Strategies



Chapter 4
Implementation Strategies

4.1 Introduction

The success of Stockton's CAP is dependent on the cooperation, commitment, and participation of the community. This section outlines key steps that the City would follow in order to ensure that the measures in the CAP are implemented effectively and efficiently so that the City achieves maximum GHG benefits and cost savings.

Successful implementation of the CAP would require a framework be developed for the following components.

- Administration and staffing.
- Financing and budgeting.
- Timelines for measure implementation.
- Supporting strategies.
- Community outreach and education.
- Monitoring, reporting, and adaptive management.

Implementation guidelines and detailed action steps for individual measures are also required to facilitate the development of policies and regulations. In general, the City would have limited responsibility in implementing state programs, other than tracking the GHG benefits. The City does not currently have systems in place for implementing and tracking large-scale infrastructure projects. Establishing a cohesive management approach is necessary to ensure the CAP measures are implemented in a timely manner. The following sections describe the potential strategies City's overall plan to implement the CAP. Details on individual measures, including financing, action steps, and progress goals are provided at the conclusion of the chapter.

4.2 Climate Action Plan Implementation Plan

4.2.1 Administration and Staffing

The City would appoint an Implementation Coordinator as part of the fiscal year 2014/15 budget process to oversee the successful implementation of all selected GHG reduction strategies. The Implementation Coordinator would be responsible for monitoring and reporting on progress towards implementing the CAP. In addition, he/or she would have the following responsibilities.

- Secure long-term financing for GHG reduction measures.
- Coordinate with City Departments.
- Serve as the external communication hub to local and regional climate action organizations.
- Conduct public outreach to inform the community of the City's reduction planning efforts.

- Investigate methods to utilize existing resources and harness community support to better streamline implementation of the CAP.
- Develop a protocol for monitoring the effectiveness of emissions reduction programs.
- Establish guidelines for reporting and documentation on emissions reduction progress.
- Submit annual reports to the City Council.
- Develop a protocol for utilizing the real-time information collected through the verification process to modify and revise existing reduction programs.
- Track state and federal legislation and its applicability to the City.

4.2.2 A Public/Private Partnership for Downtown Revitalization

On August 28, 2012, the Stockton City Council received a presentation on the work and recommendations of the Urban Land Institute's *Advisory Services Panel Report on Downtown Revitalization*. Much of that report made the case for establishing a public/private partnership, as a means of achieving public goals through private values and investment. Those recommendations, all of which were adopted by the Council, have relevance to the purpose and goals of this Climate Action Plan and, ultimately, to the success of its implementation and results.

Setting the Stage

Unquestionably, if the City of Stockton hopes to have a sustainable source of revenues to provide for basic needs and services, it needs to grow its economy. Infill development, transit-oriented development and adaptive reuse of land and structures, as envisioned in this Climate Action Plan, can be a major contributing part to that new economy. Costs savings over the life-cycle of such land development are discussed in the ULI report. Another contributing factor to the new economy is a streamlined City government that fosters private enterprise that can operate and thrive under the goals and measures of this Climate Action Plan. Another contributing factor is the preparation of an economic development strategy that is in-line with the goals and measures of this Climate Action Plan.

Cultural and structural changes to the conduct of government and business enterprises are called for in both the ULI Advisory Panel Report and this Climate Action Plan. Those changes go to the heart of what will be needed to jump-start and then sustain the City's future growth pattern, reduction in vehicle miles travelled through smarter siting of land uses, adaptive reuse of land and structures, provision of transit options, and a green building program, and other measures. It is not something accomplished overnight and in a vacuum. It is here that a lesson can be taken from the Stockton Marshall Plan, and Stockton's success with the Violence Reduction Initiative and the establishment of Community Response Teams and other such efforts. There was a critical forging of community stakeholders to plan and strategize a plan of action, and a coalescing of various resources to successfully implement that strategy. The widespread public interest to create an economically vibrant Downtown, one that also fulfills the goals and measures of this Climate Action Plan, warrants a similar stakeholder process.

In these regards, the CAPAC has and will continue to serve the role of planning, encouraging and monitoring the many measures in this Climate Action Plan aimed at greenhouse gas emissions reduction. To provide added focus, the City intends to establish a public/private partnership with key stakeholders regarding revitalization in the Greater Downtown neighborhoods and forging a

complementary economic development strategy as envisioned in the ULI Report.

The Structure of a Partnership

The staff report accompanying the ULI Report (August 28, 2012 Stockton City Council agenda) reads in part:

Cities in the Central Valley of California today are facing continued financial difficulty brought by a lagging recession, mortgage foreclosures, federal regulations, state regulations and shifting of financial resources. These changes in the shift in the historic relationships between these three levels of government puts greater strain at the local level. The combined federal and state funding for local government which has seen a dramatic reduction will continue given existing and projected federal and state deficits.

The cumulative effect of these changes has been a loss of revenues, impact of greater imposed regulation and the demand to assume greater responsibility for services. Given the cumulative effect of these changes the ULI Plan states, "cities must seek out new solutions and methods for addressing these needs and the future.'

The Panel is clear that these new solutions are a broad usage of public/private partnerships. In the real estate realm, public-private partnerships have become a common method for achieving public goals while encouraging private capital to invest in a City. 'To be successful the investment and development community needs and wants to be invited into a joint development process.' To successfully achieve the objective of public/private partnerships 'the culture surrounding the relationship of public values and investment and private values and investment needs to be one of mutual respect.

To this end, the City of Stockton is working towards the establishment of a public/private partnership for revitalization of the Downtown and the preparation of a Stockton Metropolitan Area Economic Development Strategic Plan, both of which have relevance to the infill development goals of the Settlement Agreement and emissions reductions goals of this Climate Action Plan.

The structure of such a partnership, as suggested by the ULI Advisory Panel Report, would include direct partners (those who could be directly involved in the physical revitalization financing and maintenance of the Downtown) and supportive partners (those who bring special expertise and enthusiasm to the revitalization process). The City's role with the partnership would principally be that of a convener and land/infrastructure owner. Members would represent Downtown property owners, private developers/investors, the County of San Joaquin, the Regional Rail Commission, the Regional Transit District, the University of the Pacific, the Downtown Stockton Alliance, the Chamber of Commerce, members from the bank and financial service sector, and other members.

4.2.3 Financing and Budgeting

This section presents costs and savings related to the local GHG reduction measures and potential existing and future funding sources and financing mechanisms.

Costs and Savings

As discussed in Chapter 3, there will be capital/upfront costs for most of the local GHG reduction measures, as well as operations and maintenance costs, and implementation costs for the City of Stockton for many measures as well. There will also be annuals savings for many of the measures in

form of decreased electricity and natural gas energy bills, decreased vehicle/fuel use and other savings. As indicated in Table 3-2 in Chapter 3, some of the measures have positive net present values meaning that they represent a net savings when taking into account discount rates while other have negative net present values indicating that they represent long-term net costs. As noted previously, some costs cannot be estimated at this time as they depend on further program development to better define costs and savings.

Table 3-3 in Chapter 3 presents the costs that are expected to be incurred by the City of Stockton government including capital costs, operations and maintenance costs, as well as implementation costs to develop and operate new programs included in the CAP where existing data supports quantitative estimates at this time. Table 3-4 in Chapter 3 presents the costs that are expected to be incurred by the private sector including capital costs, operations and maintenance costs for new programs included in the CAP where data supports estimates at this time.

Implementation of the local GHG reduction measures described in Chapter 3 will require the City and other public agencies, local businesses, developers/builders, and existing commercial building owners and households to incur increased costs for the capital improvements and other investment costs as well as increased operations and maintenance costs, though in certain cases operating costs are anticipated to decrease, thus offsetting other cost increases. This section presents existing and potential future funding sources that can pay for these costs. Following a summary of costs, this section contains a description of funding and financing options. Because current economic and fiscal conditions limit the funding resources and options and the related ability to finance costs associated with local reduction measures, this section also identifies additional funding sources that may become more feasible in the future.

Total estimated capital costs for the City are expected to reach approximately $28.5 million, while capital costs for the private sector could range from $68 to $426 million. There would be additional capital costs for RTD for buses included in the Transit Plan (Measure Trans-6) of $2.5 million. The total capital costs could range from $100 million to $457 million. The primary reason for the variance is the upfront costs for solar measures (Energy-5 and Energy-6), which have divergent upfront costs depending on whether those costs are paid by the building owner (in which case they are costs incurred in Stockton) or whether they are paid by a solar provider (in which case they usually are not).

Upfront (one-time) program development costs for the City of Stockton are estimated to reach approximately $1.4 million for the City. Annual City staff costs are estimated as roughly $140,000 (1 FTE for the Implementation Coordinator, offset by a savings of $151,000 in annual operating and maintenance costs primarily due to energy savings). The City might be able to derive substantial additional energy cost savings from retrofits for municipal buildings, but this cost savings has not been estimated at this time.

From an economic perspective it is important to note that many of the local reduction measures offer improvements in service, efficiency, and quality of life that provide benefits beyond the targeted reductions in greenhouse gas emissions.

Capital Costs

As shown in Tables 3-2, 3-3 and Table 3-4 in Chapter 3, capital costs were estimated for many of the local reduction measures. In the owner-financed solar scenario, the most significant costs are associated with Energy-6 (Residential and Non-Residential Rooftop Solar) projects. In the PPA solar scenario, the most significant costs are associated with Energy-3 (Energy Efficiency Programs to Promote Retrofits for Existing Residential Buildings) projects, which would represent more than half of the total estimated private-sector capital cost.

The capital costs can be characterized as follows:

- **Development Review Process (DRP) Measure** capital costs have not been estimated. These costs are likely to be absorbed into the construction costs and be offset in one manner or another in a fashion similar to other regulatory requirements.
- **Building Energy Measures** fall predominantly to the private sector to undertake and fund. These measures envision several types of energy efficiency and renewable energy upgrades to new and existing development citywide.
- **Land Use and Transportation Measures** have capital costs primarily associated with changes to existing transportation infrastructure to reduce vehicle miles traveled (VMT). Public agencies will be responsible for undertaking and funding nearly all of these measures but private development will have a role in certain measures such as Trans-8b, which is a voluntary TDM measure.
- **Waste Measures** comprise those actions necessary to increases the waste diversion rate citywide. No capital costs are foreseen for this measure at this time but could be incurred if the City were to develop new municipal recycling or reuse facilities to support increased waste diversion. Capital and operating costs would likely be incurred by waste providers that would be passed on in terms of potential increased waste disposal fees.
- **Water Measures** aim to reduce water consumption; capital costs are associated with the construction of new water infrastructure and water efficiency and retrofits of existing plumbing fixtures in private homes.
- **Other Measures** relate to Wastewater, Urban Forestry, High Global Warming, and Off-Road Vehicles. These measures include a variety of GHG reduction efforts; some of these would fall to the public sector (local wastewater treatment plant, City), while others would involve participation by private businesses and residents.

City Implementation Costs

Local reduction measures will require a variety of implementation activities, including amendments to existing ordinances or the creation of new code/ordinances, the development and administration of promotional programs, project planning, and tracking/monitoring efforts. Nearly all of these activities fall to the public sector and will occur over a period of years. In order to implement this plan, the City would need to absorb these implementation costs into its regular operating costs.

Upfront development costs, described in Chapter 3 in Table 3-3, are anticipated to amount to nearly $1.4 million. Estimated costs for City measures are a function of upfront costs, operations and maintenance costs (or savings), and the 1 FTE for the Implementation Coordinator. As noted above,

the City might be able to derive substantial additional energy cost savings through retrofits of municipal facilities that could help to offset the net annual operational costs identified to date. Final staffing and associated implementation costs will be determined as part of the fiscal year 2014/15 budget process.

Near-Term Funding and Financing Options

Implementation of the CAP is resource dependent and will rely on the ability of the City to obtain grants and other local funds. Table 4-1 presents a set of funding sources for capital costs associated with each local reduction measure (including both City and private-sector costs). It is expected that these sources could be utilized to help achieve the CAP's overall GHG reduction target.

Funding Mechanisms for Capital Improvements

Private Funding

Some measures (e.g., Energy-1 or DRP-1) will require new development to include energy saving and/or other improvements that will increase construction costs but at the same time are expected to generate annual cost savings equivalent to the value of the improvements over a certain number of years. Under normal economic conditions these improvements should increase the price of the building to account for buyer preferences and the discounted value of long-term annual savings. However, given current economic conditions, it may not be the case that highly energy-efficient homes/buildings can garner a higher price compared to other, conventional-energy homes/ buildings.

Builders who own and operate buildings (i.e., commercial buildings or apartment complexes) can use private equity to finance these improvements, with returns realized as future cost savings (energy expenditures, etc.). As market conditions improve over time, rents can be increased to defray the investment costs.

Similarly, other Measures, such as Energy-2 through Energy-5, encourage existing building owners/homeowners to install significant energy-efficiency upgrades. The cost of these "retrofit" improvements could be funded by increasing rents (commercial buildings) and/or realizing the net energy cost savings back toward costs (households). However, the long payback periods for some of these measures (particularly Energy-5) may inhibit wide-scale, private-sector participation, thus requiring public subsidies or incentives such as rebates and/or incentives offered by public utilities.

The City could also promote Power Purchase Agreements (PPA)'s to promote energy savings. In a PPA, a private company or third party purchases and installs a renewable energy technology, often solar panels. The third party maintains ownership of the installed panels and also monitors and maintains the systems to ensure functionality. The contract period for a PPA is typically 15 years, at which point the third party will either uninstall the panels or sign a new agreement with the building owner. The power produced is sold to customers on a per kilowatt-hour basis at a contractually-established rate.[40]

In addition, the City could promote on-bill financing (OBF) to fund energy improvements to City businesses. OBF provides no-interest financing for businesses and government agencies to make

[40] The rate is lower than what customers pay their utility today, and increases annually at a fixed percentage (usually 2.5 to 4.0 percent) that is typically lower than the rate escalation by the utilities.

energy efficiency retrofit improvements. Funding is provided in the form of a no-interest loan that is paid back through a monthly utility bill. Financing is available to fund many technologies, including lighting, refrigeration, HVAC and LED street light projects. Government agencies may qualify for loans between $5,000 and $250,000 per PG&E meter, with loan periods up to 120 months. Business customers may qualify for loans between $5,000 and $100,000, with loan periods up to 60 months.

Utility Rebates

The following rebates will help create incentives for building energy investments.

- **California Solar Initiative**. Pacific Gas & Electric (PG&E) is one of three utilities participating in the state's Go Solar Initiative. This program provides a variety of rebates, incentives, and other types of support for both existing and new homes. Program rebates apply to photovoltaics, thermal technologies, and solar hot water, and is designed to accommodate single-family homes, commercial development, and affordable housing. These programs have a total budget of $2.2 billion between 2007 and 2016 for solar generation and $250 million between 2010 and 2017, for thermal systems (i.e., new solar hot water systems).
- **Energy Upgrade California – San Joaquin County**. The City could help promote this program to City residents to facilitate home energy upgrades. Energy Upgrade California is funded by the American Recovery and Reinvestment Act, California utility ratepayers, and private contributions. It is administered by participating utilities. Under this program, a homeowner selects one of two energy upgrade packages, basic or advanced, with each offering different enhanced options. The program connects homeowners with home energy professionals, including participating contractors and Whole-House Home Energy Raters. In addition, rebates, incentives, and financing are offered. For instance, homeowners can get up to $4,000 back on an upgrade through a local utility.

State and Federal Funds

The following federal and state funding mechanisms will help to incentivize various GHG reduction measures.

Federal Tax Credits for Energy Efficiency

The City could promote the Federal Government's tax credits for energy efficiency to City residents. Tax credits available through 2013 include , Heating, Ventilating, Air Conditioning (HVAC), Insulation, Roofs (Metal & Asphalt), Water Heaters (non-solar), and Windows. The credit is for 10% up to $500 or for a specific amount from $50 to $300. Tax credits available through 2016 provide a discount of 30 percent of cost with no upper limit for Geothermal Heat Pumps, Small Wind Turbines (Residential), and Solar Energy Systems. The 2016 tax credits also include 30 percent of the cost up to $500 per 0.5 kW of power capacity for fuel cells in a principal residence.

Energy Efficient Mortgages

The City could promote Energy Efficiency Mortgages (EEM) to City residents. An EEM is a mortgage that credits a home's energy efficiency in the mortgage itself. EEMs give borrowers the opportunity to finance cost-effective, energy-saving measures as part of a single mortgage. To get an EEM a borrower typically has to have a home energy rater conduct a home energy rating before financing is approved. This rating verifies for the lender that the home is energy-efficient. EEMs are typically used to purchase a new home that is already energy efficient such as an ENERGY STAR qualified home.

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Table 4-1. Local GHG Reduction Measures, Funding Sources

GHG Reduction Measure		Additional Initial Capital Costs Due to CAP	Federal/State Funding	City Funding	Other Public Agency Funding	Private Funding	New Financing Mechanisms	Other Long-Term Funding Sources	Future Funding Sources
Multisectoral									
DRP-1	Development Review Process – 29% reduction for discretionary projects (Mandatory, but flexible choice of measures)	Represents existing CEQA practice – not an additional cost of the CAP.	Federal tax credits for energy efficiency or solar Energy Efficient Mortgages (FHA, VA, Fannie Mae/Freddie Mac)			Private Equity			New DIFs CFDs
Multisectoral Subtotal		--							
Building Energy									
Energy-1	Existing Green Building Ordinance (Mandatory)	Existing ordinance - not an additional cost of the CAP	Federal tax credits for energy efficiency Strategic Growth Council grants for planning		Public Utility Rebate/Incentive Funding	Private Equity		Long-Term: Home Sales, Building Rents	AB 811 District (Commercial)
Energy-2a	Outdoor Lighting Upgrades (City Initiative)	$5.8 million		General Government CIP (Buildings/City Property) General Fund Sources				Long-Term: Energy Cost Savings	
Energy-2b	Outdoor Lighting Upgrades (Voluntary for private development)	$5.0 million				Private Equity		Long-Term: Energy Cost Savings	AB 811 District (Commercial)
Energy-3	Energy Efficiency Incentives and Programs to Promote Retrofits for Existing Residential Buildings (Voluntary)	$37.5 million	Federal tax credits for energy efficiency, Community Block Grants Energy Improvement Mortgages (FHA, VA, Fannie Mae/Freddie Mac)		Public Utility Rebate/Incentive Funding	Private Equity		Long-Term: Energy Cost Savings, Increased Rents	
Energy-4	Energy Efficiency Incentives and Programs to Promote Retrofits for Existing Non-residential buildings (Voluntary)	$5.3 million	Federal tax credits for energy efficiency Energy Improvement Mortgages(FHA, VA, Fannie Mae/Freddie Mac)		Public Utility Rebate/Incentive Funding	Private Equity	Revolving Loan Fund	Long-Term: Building Sales and/or Rents	AB 811 District (Commercial)
Energy-5	Solar Powered Parking (Voluntary)	Ranges up to $38.4 million (depending on financing approach)	Federal tax credits California Solar Initiative			Private Equity/ Power Purchase Agreement with solar providers	Revolving Loan Fund	Long-Term: Building Sales and/or Rents	AB 811 District (Commercial)
Energy-6	Residential and Non-Residential Rooftop Solar (Voluntary)	Ranges up to $319.7 million depending on financing approach)	California Solar Initiative Federal tax credits			Private Equity/ Power Purchase Agreement with solar providers	Revolving Loan Fund	Long-Term: Building Sales and/or Rents	AB 811 District (Commercial)
Building Energy Subtotal		*Ranges from $53.6 million to $ $411.7 million(depending on financing approach)*							
Land Use and Transportation									
Trans-1	Land Use/Transportation System Design Integration (City Initiative/Voluntary for private development)	Not quantified. Costs may be higher or lower than development of equivalent units on edge of city. (transit costs not included)	Possible infill housing funding from federal/state sources (such as State's Infill Infrastructure Grant Program)	Transportation CIP		Private Equity			
Trans-2	Parking Policies (City Initiative)	$25,000 for new signage and meters (transit costs not included)							
Trans-3	Transit System Support (City Initiative)	$640,000 (transit costs not included)			RTD Ridership Fare Increase				

GHG Reduction Measure		Additional Initial Capital Costs Due to CAP	Federal/State Funding	City Funding	Other Public Agency Funding	Private Funding	New Financing Mechanisms	Other Long-Term Funding Sources	Future Funding Sources
Trans-4	Efficient Goods Movement (City Initiative)	Existing projects – not a consequence of the CAP	Regional Transportation Plan (Federal/State)	Transportation CIP					
Trans-5	Reduce Barriers for Non-Motorized Travel (City Initiative)	$6.1 million	<u>Federal</u> - Surface Transportation Program (STP) - Congestion Management & Air Quality Mitigation (CMAQ) - Transportation Enhancement Activities (TEA) - Recreational Trails Program - Safe Routes to School <u>State</u> - Bicycle Transportation Account (BTA) - Transportation Development Act (TDA) Article III - Safe Routes to School - Environmental Enhancement (EEM)	- Measure K - TDA Local Transportation Fund - Development Mitigations / Conditions of Approval	<u>State/Local District</u> National Highway System Fund (NHS) Transportation Funds for Clean Air (TFCA) Office of Traffic Safety (OTS)			- Homeowners Associations	<u>State and Federal</u> - Transit Enhancement Activity, Section 3003 - Section 3 Mass Transit Capital Grants - National Highway Safety Act - Bridge Repair and Replacement Program (BRRP) - Flexible Congestion Relief (FCR) Program - State Highway Operations and Protection Program (SHOPP) <u>Local</u> - Special Districts - Motor Vehicle Fees - Landscape & Lighting District (L&L)
Trans-6	Transit System Improvements (City/RTD Initiative)	$2.5 million for buses in Transit Plan plus undetermined other costs for RTD to maintain current mode split (see Transit Plan)	<u>Federal</u> - FTA Section 5307 - FTA Section 5309 - Congestion Mitigation/Air Quality (CMAQ) - FTA Section 5311 - FTA Section 5311 (f) - FTA Section 5316 - FTA Section 5317 <u>State</u> - Proposition 1B - State Transit Assistance (STA) Funds	- Transportation Development Act (TDA): Local Transportation Fund				- Business Improvement District (BID) - Public/Private Partnerships - Retail and Merchant Contributions - Employer Contributions	<u>Federal</u> - FTA Section 5309 - FTA Section 5311(f) - TIGGER (Recovery Act) <u>State, Regional and Local</u> - Safe Routes to School Grant Funding Program - Proposition 1B - San Joaquin Valley Air District: Rule 9410, “eTRIP Rule” - Measure K - City Central Parking District - SJCOG Regional Transportation Impact Fee - RTD taxing authority
Trans-7	Safe Routes to School (City Initiative)	$7.5 million	Safe Routes to Schools (Federal/State)	Transportation CIP					
Trans-8a	Additional Safe Routes to School (City Initiative)	$7.5 million	Safe Routes to Schools (Federal/State)	Transportation CIP					
Trans-8b	Transportation Demand Management (Voluntary for Private Development)	Depends on TDM measures			Possible SJVAPCD support to help develop TDM programs				

GHG Reduction Measure		Additional Initial Capital Costs Due to CAP	Federal/State Funding	City Funding	Other Public Agency Funding	Private Funding	New Financing Mechanisms	Other Long-Term Funding Sources	Future Funding Sources
Land Use and Transportation Subtotal		*$24.2 million*							
Waste									
Waste-1	Increased Waste Diversion (Mandatory)	Costs associated with recycling and diversion facilities not quantified.	CalRecycle Grant Program			Waste disposal fees			
Waste Subtotal		--							
Water									
Water-1	Comply with SB X7-7 (Mandatory)	State mandate – not an additional cost of the CAP			Water Rate Increase				-Utility Rate Increase -Utility User Tax Increase
Water-2	Promotion of Water-Efficiency for Existing Development (Voluntary)	$12 million			Fixture Install Rebates	Private Equity		Long-Term: Building Sales and/or Rents	
Water Subtotal		*$12 million*							
Wastewater									
Wastewater 1	Energy Efficiency Improvements at the RWCF (City Initiative)	$300,000			Wastewater Rate Increase				
Wastewater Subtotal		*$300,000*							
Urban Forestry									
Urban Forestry 1	Urban Tree Planting Programs (City Initiative)	$590,000		General Fund Sources					
Urban Forestry Subtotal		*$590,000*							
High Global Warming Potential GHGs									
HGWP GHG-1	Residential Responsible Appliance Disposal (RAD) Programs (City Initiative)	Construction costs to build or renovate a drop-off center (not quantified)							
High Global Warming Potential GHGs Subtotal		--							
Off-Road Vehicles									
Off-Road-1	Electric Powered Construction Equipment (Voluntary)	Additional equipment costs (not quantified)	Possible CARB incentives		Possible SJVAPCD Grants	Business Private Equity			
Off-Road-2	Reduced Idling Times for Construction Equipment (Mandatory)	$8.2 million	Possible CARB funding to develop ordinance		Possible SJVAPCD Grants	Business Private Equity			
Off-Road-3	Electric Landscaping Equipment (Voluntary)	Additional equipment costs (not quantified)	Possible CARB incentives		Possible SJVAPCD Grants	Business Private Equity			
Off-Road Vehicles Subtotal		*$8.2 million*							
Total (Does not include unquantified measures)		***Ranges from $98.9 to $457.0 million (depending on financing approach)***							

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California Department of Resources Recycling and Recovery (CalRecycle)

The City could apply for CalRecycle grant programs, which are authorized, by state legislation, to assist public and private entities in the safe and effective management of the waste stream. Funds are intended to further reduce, reuse, and recycle all waste, encourage development of recycled-content products and markets, and protect public health and safety and foster environmental sustainability. Incorporated cities and counties in California, as identified by the California Department of Finance, are eligible to receive funding.

California Air Resources Board

The California Air Resources Board has several air pollution incentives, grants, and credit programs that could be utilized to help fund Local measures. The following programs will offer grant opportunities over the next several years with the goal of reducing emissions from on- and off-road vehicles and equipment:

- Air Quality Improvement Program (AB 118)
- Enhanced Fleet Modernization Program (AB 118)
- Carl Moyer Program – Voucher Incentive Program
- Goods Movement Emission Reduction Program
- Loan Incentives Program
- Lower-Emission School Bus Program / School Bus Retrofit and Replacement Account

Existing Capital Improvement Programs

It can be assumed that state and federal funds will continue to local governments, builders, and homeowners in various forms including grants, transportation and transit funding, tax credit and rebate programs, etc. If not already in the capital improvement program (CIP) for existing regional fee programs, projects associated with most of the local reduction measures pertaining to traffic or transit could potentially be added to these CIPs.

State Funding for Infrastructure

Similarly, the State's Infill Infrastructure Grant Program may be able to provide funding toward Measure Trans-1 (Land Use/Transportation Design Integration); this program seeks to promote infill housing development. Grants are available as gap funding for infrastructure improvements necessary for specific residential or mixed-use infill development projects.

Transportation-Related Federal and State Funding

Measures Trans-3 through Trans-8 will require a variety of federal and State funding sources that have been previously identified in the City's Bicycle Master Plan and the City's Transit Master Plan as shown in Table 4-2.

Table 4-2. State and Federal Transportation Funding Sources

Safe, Accountable, Flexible, Efficient Transportation Equity Act – Legacy for Users (SAFETEA-LU).	FTA Small Starts
Surface Transportation Program Fund, Section 1108 (STP)	FTA Section 5311(f)
Congestion Mitigation and Air Quality Improvement Program, Section 1110 (CMAQ)	California's Bicycle Transportation Account (BTA)
Transportation Enhancement Activities (TEA)	Environmental Enhancement and Mitigation (EEM) Program
National Recreational Trails Program	Safe Routes to School (SR2S)
National Highway System Fund (NHS)	Office of Traffic Safety (OTS)
National Highway Safety Act, Section 402	Transportation Development Act (TDA) Article III
Transit Enhancement Activity, Section 3003	Transportation Funds for Clean Air (TFCA, formerly AB 434)
Section 3 Mass Transit Capital Grants	Flexible Congestion Relief (FCR) Program
Bridge Repair & Replacement Program (BRRP)	State Highway Operations and Protection Program (SHOPP)
Federal Transit Administration (FTA) 5309	

City Funding

The City has a CIP that provides funding for needed City infrastructure improvements. In many cases, the measures can be integrated into the City's CIP (or the enterprise utility CIPs). For example, the replacement of street lights with LED bulbs envisioned under Local Measure Energy-2 (Outdoor Lighting Upgrades) could be integrated into the City's CIP.

Public Utility Enterprises

The City operates water and sewer public utilities supported by rates that cover the cost of their infrastructure and operations. An increase in these rates to fund capital improvements associated with local reduction measures Waste-1, Water-1, Water-2 (implementation costs), and Wastewater-1 could be considered.

Other Local/Regional Funding Sources

- **Measure K.** San Joaquin County voters approved Measure K in 1990 to fund transportation projects through a half-cent sales tax increase and voted to renew Measure K in 2006. According to the City's Bicycle Master Plan, between 2007 and 2011, SJCOG anticipates it has funded $1.2 million in bicycle projects throughout the County with Measure K funds.
- **AB 2766 and SB 709 (also known as Remove II).** Vehicle registration fees of $19 annually are paid within the San Joaquin Valley Unified Air Pollution Control District for air quality mitigation. These funds are converted into programs for transit, bikeways, alternative fuels, public awareness campaigns, ride share, etc., and are distributed on a competitive basis.
- **Bus Stop Sponsorships**. As suggested in the City's Transit Plan, RTD could consider sponsorships at bus stops and even on buses. The Plan cites Portland Streetcar program as an example; this program generates approximately $250,000 per year for its vehicle and bus stop

sign sponsors.

- **Transit Fare Increases.** As suggested in the City's Transit Plan, RTD could increase fares to help to fund capital improvements, though increases also have the potential to decrease ridership in the short term.
- **Parcel Tax**. RTD currently collects nearly $1 million annually from a parcel tax set at 1.5%

Funding Mechanisms for Implementation

Implementation costs, described in Chapter 3, will be integrated into the City's existing operating Budget and CIP as the City and other public agencies will be responsible for implementing local reduction measures. Given fiscal constraints it may be necessary to support increased operating costs with charges applied to capital programs, grants, and other new revenue sources. As an example of a grant that could be utilized, the City could pursue grants for planning from the Strategic Growth Council (SGC) of the State Department of Conservation (DOC). The SGC manages competitive grants to cities, counties, and designated regional agencies that promote sustainable community planning and natural resource conservation. The DOC has allocated approximately $18 million of Proposition 84 as competitive grant funding to support development, adoption, and implementation of Sustainable Community planning elements, including, but not limited to, Climate Action Plans and General Plan amendments. The grants awarded from this solicitation will cover up to a three-year project period. Grant requests for amounts from $100,000 to $1,000,000 will be considered.

Future Funding Options

While current economic conditions and fiscal realities limit funding options for the local reduction measures, as the economy recovers additional funding sources that are currently infeasible may become realistic. These potential future funding sources are described below.

Funding Mechanisms for Capital and/or Implementation Costs

AB 811 Districts (PACE)

AB 811 is a California environmental law signed into law in 2008 to help California municipalities accomplish the goals outlined by the Global Warming solutions Act of 2006. AB 811 authorized all California cities and counties to designate areas where property owners could enter into contractual assessments to receive long-term, low-interest loans for energy and water efficiency improvements and renewable energy installations on their property. The financing is repaid through property tax bills. AB 811 only allows for financing of the purchase and installation of appliances that are permanently attached to real property.

The property-assessed clean energy (PACE) finance program is the state of California's AB 811 program; the program is designed to finance the installation of energy and water improvements within their home or business via a land-secured loan, repaying the amount through property assessments. Eligible projects under the CaliforniaFIRST Program may include, but are not limited to: air sealing, wall and roof insulation, energy-efficient windows, tankless water heaters, solar photovoltaics, and low-flow toilets.

For residential properties, AB 811—and the PACE program-- is on hold in some areas owing to a decision, in July of 2010, by the Federal Housing Finance Agency (FHFA), to halt all lending through these programs after it was determined that the senior AB 811 District loans are in violation of

standard mortgage contracts guaranteed by the federal government. Some agencies, such as the Western Riverside Council of Governments, have innovated ways to provide AB 811 style financing despite the federal constraints through the HERO program by making sure that federal mortgage obligations are maintained while using property tax secured financing. The City Stockton decided to join the HERO program in spring of 2014.

There is no concern for PACE-style financing districts for commercial properties relative to the FHFA concerns since FHFA is not involved in commercial property loans.

Implementing Actions

The City will need to undertake a series of steps in order to move local reduction measures into action. The nature of these tasks ranges widely and includes both regulatory and discretionary actions on the part of the City.

- **Refine cost estimates.** As described in Chapter 3, the estimated costs for local reduction measures are based on a variety of participation, per-unit, and other assumptions. For example, Trans-7 (Safe Routes to Schools) envisions the construction of 20 infrastructure projects to increase the percentage of school-aged children walking or bicycling to school. Implementation actions for this Measure would include selecting a set of 20 projects and preparing detailed cost estimates for these projects
- **Integrate GHG Measures into existing City Budget and CIP.** Multiple capital improvements, particularly those identified in Energy and Land Use/Transportation Measures, will need to be added to the City's CIP and facility master plan programs, as well as those of the City utility enterprises and other public agencies (e.g., RTD).
- **Adopt or update ordinances and/or codes.** Some local reduction measures represent a continuation of recently enacted ordinances (e.g., Energy-1's association with the City's existing Green Building Ordinance), while others would require new ordinances or plans (e.g., Trans-1: Land Use/Transportation System Design Integration). Staff will need to coordinate these efforts in conjunction with the City Council.
- **Pursue outside funding sources.** A range of funding from State and federal agencies have been identified. The City will need to pursue these (and other emerging) funding sources as a part of implementation efforts.
- **Implement and direct preferred City funding sources**. While City funding sources are limited, the City, as a part of its budget process may need to appropriate funding from general sources or make changes in its fee schedules, utility rates, and other sources as needed to fund the implementation of the GHG reduction measures.
- **Create monitoring/tracking processes.** Several local reduction measures will require program development, tracking, and/or monitoring. For example, Water-2 (Promotion of Energy-Efficiency in Existing Development) will necessitate staff time to promote replacement of water fixtures; the City may also desire to track the number of households that participate in the program as well as the amount of water saved over time.
- **Identify economic indicators to consider future funding options.** Economic recovery may occur rapidly or slowly. Whatever the timeframe, the City will need to determine the point at which certain additional funding sources will become feasible and/or desirable. Identification and monitoring of economic indicators, such as home prices, unemployment rates, or real wage

increases, can help the City in deciding when to further explore the potential for local reduction measures to be funded.

4.2.4 Timelines for Measure Implementation

It is anticipated that the CAP would be implemented in phases. The following is an outline of key priorities for three potential implementation phases.

- **Phase 1 (2014-2015)**: Phase 1 would occur in 2014. During this phase, the City would develop key ordinances, programs, policies, and procedures required to support and enforce the local mandatory GHG reduction measures. The City would also advance the Greater Downtown Stockton Area Specific Plan.[41] Likewise, the City would create a planning framework, which would guide implementation of the voluntary measures and DRP. Measure funding would be secured. The City would encourage implementation of cost-effective measures identified in the CAP. A cost-benefit analysis of measures not analyzed in the CAP (i.e., urban forestry, high GWP GHG, and off-road measures) would be completed. In 2015, the City would conduct an updated community GHG inventory to monitor emissions trends.
- **Phase 2 (2016–2017)**: Phase 2 would occur between 2016 and 2017. During Phase 2, the City would continue to implement measures that were begun in Phase 1. The City would evaluate the effectiveness of these measures and adapt management procedures accordingly. The City would also select and encourage implementation of Phase 2 measures.
- **Phase 3 (2018–2020):** Phase 3 would occur between 2018 and 2020. The City would continue to implement and support measures begun in Phases 1 and 2, and encourage implementation of all remaining CAP measures (Phase 3 measures). An analysis of the effectiveness of Phase 1 and 2 measures would be conducted, as well as an updated community GHG inventory. The City would begin developing plan for post-2020 actions.

To encourage implementation of all reduction measures, the Implementation Coordinator would develop a CAP Implementation Timeline. Measure prioritization would be based on the following factors:

- Cost/Funding—How much does the measure cost? Is funding already in place for the measure?
- Greenhouse Gas Reductions—How effective is the measure at reducing greenhouse gases?
- Other Benefits—Does the measure improve water quality or conserve resources? Would it create jobs or enhance community wellbeing?
- Consistency with Existing Programs—Does the measure compliment or extend existing programs?
- Impact on the Community—What are the advantages and disadvantages of the measure to the community as a whole?
- Speed of Implementation—How quickly can the measure be implemented and when would the City begin to see benefits?
- Implementation Effort—How difficult would it be to develop and implement the program?

Table 4-3 presents potential preliminary timeline and phasing schedule for the GHG reduction

[41] Funding for the Downtown Specific Plan has been included in the proposed CDD budget for FY 2013/2014.

measures. A qualitative appraisal of implementation effort for the City is also provided. Measures are categorized based on the following conventions:

- Low—Measure would require limited staff resources to develop. In some cases, existing programs may be utilized to facilitate program implementation. Policy or code revisions may be necessary, although internal and external coordination efforts would likely be limited.
- Medium—Measure would require staff resources beyond typical daily levels. Policy or code revisions may be necessary. Public outreach and coordination with stakeholders would be necessary to ensure program success.
- High—Measure would require extensive staff resources to develop and implement. A robust outreach campaign would be necessary to properly communicate program requirements and address public questions and issues.

Table 4-3. Potential Phasing and Ease of Implementation for GHG Reduction Measures

Title	Measure	Phase	Implementation Effort
Multi-Sectoral			
DRP-1	Development Review Process – 29% reduction for discretionary projects [M]	1,2,3	Low
Building Energy			
Energy-1[a]	Green Building Ordinance [M]	1,2,3	Low
Energy-2	Outdoor Lighting Upgrades [CITY,V]	1,2,3	Low
Energy-3	Energy Efficiency Programs to Promote Retrofits for Existing Residential Buildings [V]	1,2,3	Low
Energy-4	Energy Efficiency Programs to Promote Retrofits for Existing Non-residential buildings[V]	1,2,3	Medium
Energy-5	Solar Powered Parking [V]	2,3	Medium
Energy-6	Commercial and Residential Rooftop Solar [V]	1,2,3	Medium
Land Use and Transportation			
Trans-1	Land Use/Transportation System Design Integration [CITY]	1,2,3	High
Trans-2	Parking Polices [M]	1,2,3	Low
Trans-3	Transit System Support [CITY]	1,2,3	High
Trans-4	Efficient Goods Movement [CITY]	2,3	High
Trans-5	Reduce Barriers for Non-Motorized Travel [CITY]	1,2,3	Medium
Trans-6	Transit System Improvements [CITY/RTD]	2,3	High
Trans-7	Safe Routes to School [CITY]	2,3	Medium
Trans-8	Transportation Demand Management and Additional Safe Routes to School [CITY, V]	2,3	Medium
Waste Generation			
Waste-1	Increased Waste Diversion [M]	1,2,3	Medium
Water Consumption			
Water-1	Comply with SB X7-7 [M]	1,2,3	Medium
Water-2	Promotion of Water-Efficiency for Existing Development [V]	1,2,3	Medium
Wastewater Treatment			
Wastewater-1	Energy Efficiency Improvements at the RWCF [CITY]	2,3	Medium

Title	Measure	Phase	Implementation Effort
Urban Forestry			
Urban Forestry-1	Urban Tree Planting Programs [CITY]	2,3	Low
High GWP GHG			
HGWP GHG-1	Residential RAD Programs [CITY]	2,3	Medium
Off-Road Vehicle Activity			
Off-Road-1	Electric Powered Construction Equipment [V]	3	Medium
Off-Road-2	Reduced Idling Times for Construction Equipment [M]	3	Low
Off-Road-3	Electric Landscaping Equipment [V]	2,3	Medium

[a] The City's Green Building Ordinance is presently suspended pending revision.

4.3 Supporting Strategies

Successful implementation of individual GHG reduction measures requires the identification of key action items, known obstacles, and resources. The goals of several reduction measures can often be achieved through a variety of means, especially those related to building energy efficiency, renewable energy development, and improvements to the transportation network. Comprehensive implementation strategies for each measure would develop over time. However, supporting actions and recommendations for grouping measures to achieve efficiencies can be identified now (Tables 4-4 through 4-10). This section presents a series of supporting actions for each emissions sector. It identifies GHG reduction measures that would benefit from the action, recommendations for implementation, and resources for additional information. The tables presented below form a foundation on which a complete implementation plan for each measure can be built.

Table 4-4. Supporting Actions for Building Energy Measures

Supporting Action	Application	Recommendations
Energy-S1: Publicize incentives for energy efficiency and renewable energy improvements.	Energy 1 to 6	• Leverage federal tax credits or local rebates, such as those offered by Renewable Funding (property assessed clean energy, or PACE) or PG&E. • Provide innovative, low-interest financing for energy efficiency projects. • Assign a task force to identify regulatory or procedural barriers to implementing green building practices, such as updating codes, guidelines, and zoning.
Energy-S2: Implement a low-income weatherization program.	Energy 3	• Partner with community services agencies to help fund and publicize energy efficiency projects. • Target heating, ventilation, air conditioning, lighting, water heating equipment, and insulation.
Energy-S3: Adopt a voluntary inspection program for rental homes and leased non-residential buildings that	Energy 3, 4	• Encourage rented or leased buildings to meet the energy goals outlined in Energy 4 and Energy 5 at the time of inspection.

Supporting Action	Application	Recommendations
evaluates energy efficiency.		
Energy-S4: Launch energy efficiency campaigns targeted at residents and businesses.	Energy 1 to 4	• Highlight PG&E rebates and other incentive programs to help encourage residents and businesses to take advantage of them. • Schedule a date in which existing buildings are encouraged and reminded to perform an energy efficiency "tune-ups." • Promote individualized energy management services for large energy users. • Target campaigns to those communities with the highest energy consumption rates. • Provide recognition for residents or businesses adopting significant energy efficiency projects.
Energy-S5: Continue to implement the Green Building Ordinance (as updated)	Energy 1	• Continue to leverage existing resources to implement the Green Building Ordinance.
Energy-S6: Assign staff that has training related to green technologies to serve as points of contact for energy efficiency improvement projects.	Energy 1 to 4	• Maintain a single point of contact to reduce duplicative paperwork, resources, and miscommunication.
Energy-S7: Develop a renewable energy protocol to help expand renewable energy generation.	Energy 5, 6	• The protocol should include guidelines for reviewing a proposed alternative energy project against existing City policies and ordinances.
Energy-S8: Establishing a clearinghouse of information on available funding alternatives for renewable energy projects.	Energy 5, 6	• Include other information to support developers and community members interested in pursuing renewable energy projects.

Table 4-5. Supporting Actions for Land Use and Transportation Measures

Supporting Action	Application	Recommendations
Trans-S1: Develop a Greater Downtown Stockton Area Specific Plan and facilitate demonstration projects.	Trans-1	• Analyze development incentives for residential and mixed use development • Identify 1 to 2 demonstration projects to "pioneer" project delivery methods • Consider creating non-motorized zones in the Downtown core.
Trans-S2: Upgrade the transit fleet to include intelligent transportation systems.	Trans-3, 4, 6	• Upgrade signal systems to provide adaptive control, synchronization, and transit priority. • Install changeable message signs to alert drivers to unique conditions; incorporate next bus technology at transit stops.
Trans-S3: Roadway improvements to ease congestion	General	• Partner with Caltrans to provide ramp metering onto all freeways through Stockton and eliminate major freeway bottlenecks to smooth traffic flows. • Monitor traffic and congestion on city roadways to determine congestion reduction opportunities.

Supporting Action	Application	Recommendations
Trans-S4: Encourage parking programs that reduce onsite parking demand and promote ride-sharing during events at the Stockton Arena.	Trans-1, 2, 3, 6	• Encourage operators to advertise and offer discounted transit passes with event tickets. • Encourage operators to advertise and offer discount parking incentives to carpooling patrons, with four or more persons per vehicle for on-site parking. • Promote the use of bicycles by providing space for the operation of valet bicycle parking service.
Trans-S5: Provide public education and information about options for reducing motor vehicle-related GHG emissions.	Trans-3, 6, 7, 8	• Include information on trip reduction; trip linking; public transit; biking and walking; vehicle performance and efficiency (e.g., keeping tires inflated); low or zero-emission vehicles; and car and ride sharing.
Trans-S6: Collaborate with local and regional transit agencies to promote alternative fuels and increased transit.	Trans-3, 6	• Strive to improve feeder services from multimodal transit centers to downtown. • Improve the distribution of information (e.g. posted schedules and maps at all transit stops and other key locations, provision of real-time arrival information, etc.) • Give funding preference to improvements in public transit over other new infrastructure for private automobile traffic.
Trans-S7: Promote the necessary facilities, policies, and infrastructure to encourage the use of privately owned low or zero-emission vehicles, including plug-in hybrid electric vehicles (EVs).[42]	General	• Construct electric vehicle charging facilities in the downtown core and other publicity accessible locations. • Consider reducing residential speed limits to allow for expanded use of neighborhood EVs. • Provide priority parking for EVs in downtown areas and amend the zoning code to require new projects provide reserved parking spaces for EVs. • Conveniently locate alternative fueling stations. • Examine the use of smaller, more fuel-efficient taxicabs. • Consider offering incentives to taxicab owners to use gas-electric hybrid vehicles or plug-in EVs.
Trans-S8: Implement feasible "Transit Supportive Polices" outlined in the Transit Plan (Appendix D)	Trans-3, 6	• See Section 5 in the Transit Plan.

Table 4-6. Supporting Actions for Water, Waste, and Wastewater Measures

Supporting Action	Application	Recommendations

[42] Of note, Electric Vehicle International (EVI) is manufacturing the utility industry's first electric hybrid drivetrain Class 5 work trucks at its manufacturing facility in Stockton. The vehicles will offer fuel savings as well as exportable energy that can be used to power the grid during planned or unplanned outages. The trucks feature an all-electric range of 45 miles and fuel savings of up to 30 percent when the vehicles are operating in hybrid mode. EVI designed, built and tested the trucks in partnership with PG&E and the California Energy Commission.

Supporting Action	Application	Recommendations
Waste-S1: Encourage local businesses to expand their recycling and composting efforts and to reduce packaging of products manufactured in the City.	Waste-1	• Provide incentives for business owners, such as increased publicity and reduced fees. • Implement or increase the price paid for recycling glass and plastic from businesses.
Waste-S2: Enhance regional coordination on waste management to take advantage of economies of scale of recycling, composting, and other diversion programs.	Waste-1	• Support State legislation or regulatory efforts that would aid in achieving zero waste. • Encourage regional landfills to implement gas-to-energy projects or increase methane capture rates.
Waste-S3: Expand educational programs to inform residents about reuse, recycling, composting, waste to energy, and zero waste programs.	Waste-1	• Encourage local recycling and composting initiatives at the neighborhood level.
Water-S1: Promote the use of water efficient landscaping	Water-1 and Water-2	• Promote the use of recycled (non-potable) water for landscape irrigation. • Provide education on the use of sustainable plant species, and water-efficient landscape materials and irrigation systems.
Water-S2: Encourage low-impact development practices that maintain the existing hydrologic character of the site to manage storm water and protect the environment	Water-1 and Water-2	• Encourage the use of cisterns, rain barrels, bioswales and other stormwater detention/control systems and designs that can be used for irrigation.
Water-S3: Promote water audits in single family, multi-family and commercial developments.	Water-2	• Consider providing free or discounted audits.
Wastewater-S1: Continue to evaluate the feasibility and effectiveness of the *Capital Improvement and Energy Management Plan.*	Wastewater-1	• Implement all feasible short- and long-term projects.

Table 4-7. Supporting Actions for Urban Forestry Measures

Supporting Action	Application	Recommendations
Urban Forestry-S1: Encourage businesses and residences to plant shade trees.	Urban Forestry-1	• Provide free or discounted trees. • Provide educational materials on the benefits of urban trees and urban forestry. • Establish guidelines for tree planting, including criteria for selecting deciduous or evergreen trees low-VOC-producing trees, and emphasizing the use of drought-tolerant native trees and vegetation.

Table 4-8. Supporting Actions for High GWP GHG Measures

Supporting Action	Application	Recommendations
High GWP GHG-S1: Support RAD for all decommissioned appliances.	High GWP GHG-1	• Implement a price paid for recycling of refrigerators and freezers. • Establish a continently located recycling center

Supporting Action	Application	Recommendations
		where residences can drop off decommissioned appliances for transport to a certified disposal facility. • Provide public outreach and education for RAD.

Table 4-9. Supporting Actions for Off-Road Activity Measures

Supporting Action	Application	Recommendations
Off-Road-S1: Encourage construction contractors hired by the City and County to develop a construction vehicle inventory tracking system.	Off-Road-1	• Establish requirements for the system to include strategies such as requiring hour meters on equipment and documenting the serial number, horsepower, age, and fuel of all onsite equipment.
Off-Road-S2: Sponsor a lawnmower exchange program.	Off-Road-3	• Consider offering electric mowers at a low or discounted price. • Work with the San Joaquin Valley Air Pollution Control District (SJVAPCD) to support and publicize the program.
Off-Road-S3: Promote facilities and infrastructure to encourage the use of low or zero-emission equipment	Off-Road-3	• Consider requiring new development to include outdoor electrical charging units.

Table 4-10. General Supporting Actions for CAP Implementation

Supporting Action	Application	Recommendations
Other-S1: Maximize the conservation of natural areas within the City and along the fringe.	General	• Implement related policies in General Plan
Other-S2: Establish community outreach campaign to support local purchasing of goods and food.	General	• Focus the outreach campaign on the financial, health, and society benefits achieved by purchasing local products. • Consider using the campaign to highlight local businesses.

4.4 Community Outreach and Education

The citizens and businesses in Stockton are integral to the success of the CAP. Their involvement is essential, considering that several measures depend on the voluntary commitment, creativity, and participation of the community.

The City would educate stakeholders, such as businesses, business groups, residents, developers, and property owners about the CAP and encourage participation in efforts to reduce GHG emissions. The CIT would schedule periodic meetings to facilitate formal community involvement in CAP implementation and adaptation over time. These meetings would be targeted to stakeholder groups and provide information on CAP implementation progress. Stakeholders would be provided an opportunity to comment on potential improvements or changes to the CAP. The CIT would also

sponsor periodic outreach events to directly inform and solicit the input, suggestions, and participation of the community at large.

4.5 Regional Involvement

There are substantial opportunities to enhance the effectiveness of the CAP through regional collaboration. Center Valley Clear Air Now (Valley CAN) is a non-profit organization dedicated to improving air quality in communities through the San Joaquin Valley. Valley CAN strives to provide the following services:

- Serve as a leader in educating the public in the need to take personal responsibility for the reduction of air quality.
- Promote voluntary action to reduce air pollution by individual, government, agriculture, business, and industry.
- Initiate and publicize creative new approaches to reduce air pollution.
- Facilitate demonstration programs and education efforts focused on solutions to high emissions sources.

Valley CAN offers public grants for solutions to air quality problems. Previous grants have been awarded for lawn mower exchange programs, energy tune-ups, and education workshops. Valley CAN also provides a business recognition program and sponsors several clean air events, including "Tune In & Tune Up," which test vehicles for high emissions levels. The City would work with Valley CAN to promote opportunities that may improve education and help residents and businesses offset project costs.

There are several regional partners and collaboration opportunities in addition to Valley CAN that would be essential to the CAP. The City would explore the potential to leverage resources provided by these opportunities to support implementation of the CAP. Potential opportunities and partners include:

- **Groundswell San Joaquin Valley:** Groundswell's purpose is to educate the public and encourage citizen participation in local land use decision making.
- **Central Valley Air Quality Collation**: The Collation's mission is to encourage San Joaquin Valley to become a healthy, safe, and economically proposers region where chronic air pollution and epidemic sickness due to poor air quality are eliminated.
- **Green Team San Joaquin**: The Green Team is actively involved with business leaders, community leaders, and others to increase the awareness of available resources, programs, and incentives to assist in reducing business costs.
- **San Joaquin Valley Air Pollution Control District (SJVAPCD)**: SJVAPCD is the local agency responsible for developing and implementing air quality plans. The agency also sponsors various air quality programs that may support implementation of several energy efficiency, transportation, and renewable energy measures.
- **Pacific Gas and Electric Company**: PG&E offers numerous incentives and rebate programs to encourage energy efficiency. Resources offered by PG&E may reduce program implementation and administration costs. There may also be opportunities for cooperation on community-scale

alternative energy installations (e.g., wind, solar).

- **Transportation Agencies (San Joaquin Council of Governments [SJCOG], San Joaquin RTD, etc.)**: In order to fully implement the transportation reduction measures that promote mixed use development, continued coordination with regional transportation agencies would be necessary. With SB 375 and its linkage to transportation funding, it would also be crucial for the City and transportation agencies to develop a shared vision of how land use and transportation can be consistent with the next Regional Transportation Plan and the required Sustainable Communities Strategy.
- **San Joaquin County:** Waste-1 includes the adoption of a 80% waste diversion goal. Coordination with the County to provide the facilities, programs, and incentives would help ensure this goal can be achieved by 2020.
- **COSMUD and other Water Retailers:** While the City can continue to influence water efficiency through requirements for new development, the City would need to work with the water retailers in order to promote reductions in indoor and outdoor water use from existing developments and achieve the goals set forth by SB X7-7.

4.6 Monitoring, Reporting, and Adaptive Management

Regular monitoring is important to ensure programs are functioning as they were originally intended. Early identification of effective strategies and potential issues would enable the City to make informed decisions on future priorities, funding, and scheduling. Moreover, monitoring provides concrete data to document the City's progress in reducing GHG emissions. The Implementation Coordinator would be responsible for developing a protocol for monitoring the effectiveness of emissions reduction programs as well as for undertaking emissions inventory updates.

Effective monitoring would require regular data collection in each of the primary emissions sectors. For example, reports detailing annual building electricity usage and fuel consumption at the RWCF would be necessary. The Implementation Coordinator would coordinate with internal City departments, PG&E, and other stakeholders to obtain and consolidate information into repository that can be used to evaluate the effectiveness of individual reduction measures.

The Implementation Coordinator would also be responsible for tracking the State's progress on implementing the state level programs. The CAP relies heavily on state level measures. Close monitoring of the real gains being achieved by state programs would allow the City to adjust its CAP, if needed. The City would inventory, at a minimum, City GHG emissions for 2015, 2017, and 2019 in order to measure progress.

The Implementation Coordination would report annually to the City council on CAP implementation progress. Where annual reporting, periodic inventorying, or other information indicates that the GHG reduction measures are not as effective as originally anticipated, the CAP may need to be adjusted, amended, or supplemented. At a minimum, the City would conduct a 5-year review of CAP effectiveness as part of annual reporting in 2016 which would allow the potential to make mid-course adjustment in the CAP to effect change prior to 2020.

4.7 Managing the City's Greenhouse Gas Emissions after 2020

While GHG management in the state of California is currently focused on a 2020 target, Executive Order S-03-05 articulates a GHG reduction goal for California in 2050. Executive Order S-03-05 states that by 2050 California shall reduce their GHG emissions to a level that is 80% below the level in 1990. It is reasonably foreseeable that as California approaches its first milestone in 2020, focus will shift to the 2050 target. A detailed plan for how the state would meet this target is expected. The City will monitor developments at the national and state levels.

Beginning in Phase 3 (2018), the City would commence planning for the post-2020 period. At this point, the City would have implemented the first two phases of the CAP and would have a better understanding of the effectiveness and efficiency of different reduction strategies and approaches. The new post-2020 reduction plan would include a specific target for GHG reductions for 2030, 2040, and 2050. The targets would be consistent with broader state and federal reduction targets and with the scientific understanding of the needed reductions by 2050. The City would adopt the post-2020 reduction plan by December 31, 2020.

Appendix A
Settlement Agreement

MEMORANDUM OF AGREEMENT

This Memorandum of Agreement ("Agreement") is entered into by and between the City of Stockton ("City"), Edmund G. Brown Jr., Attorney General of California, on behalf of the People of the State of California ("Attorney General"), and the Sierra Club, and it is dated and effective as of the date that the last Party signs ("Effective Date"). The City, the Attorney General, and the Sierra Club are referred to as the "Parties."

RECITALS

On December 11, 2007, the City approved the 2035 General Plan, Infrastructure Studies Project, Bicycle Master Plan, Final Environmental Impact Report ("EIR"), and Statement of Overriding Considerations. The General Plan provides direction to the City when making land use and public service decisions. All specific plans, subdivisions, public works projects, and zoning decisions must be consistent with the City's General Plan. As adopted in final form, the General Plan includes Policy HS-4.20, which requires the City to "adopt new policies, in the form of a new ordinance, resolution, or other type of policy document, that will require new development to reduce its greenhouse gas emissions to the extent feasible in a manner consistent with state legislative policy as set forth in Assembly Bill (AB) 32 (Health & Saf. Code, § 38500 et seq.) and with specific mitigation strategies developed by the California Air Resources Board (CARB) pursuant to AB 32[.]" The policy lists the following "potential mitigation strategies," among others, for the City to consider:

(a) Increased density or intensity of land use, as a means of reducing per capita vehicle miles traveled by increasing pedestrian activities, bicycle usage, and public or private transit usage; and

(b) Increased energy conservation through means such as those described in Appendix F of the State Guidelines for the California Environmental Quality Act.

The 2035 General Plan also includes other Policies and goals calling for infill development, increased transit, smart growth, affordable housing, and downtown revitalization.

In December 2006, in accordance with the requirements of the California Environmental Quality Act ("CEQA"), the City prepared and circulated a Draft EIR. Comments were received on the EIR; the City prepared responses to these comments and certified the EIR in December 2007.

On January 10, 2008, the Sierra Club filed a Petition for Writ of Mandate in San Joaquin County Superior Court (Case No. CV 034405, hereinafter "Sierra Club Action"),

alleging that the City had violated CEQA in its approval of the 2035 General Plan. In this case, the Sierra Club asked the Court, among other things, to issue a writ directing the City to vacate its approval of the 2035 General Plan and its certification of the EIR, and to award petitioners' attorney's fees and costs.

The Attorney General also raised concerns about the adequacy of the EIR under CEQA, including but not limited to the EIR's failure to incorporate enforceable measures to mitigate the greenhouse gas ("GHG") emission impacts that would result from the General Plan.

The City contends that the General Plan and EIR adequately address the need for local governments to reduce greenhouse gas ("GHG") emissions in accordance with Assembly Bill 32, and associated issues of climate change.

Because the outcome of the Parties' dispute is uncertain, and to allow the Stockton General Plan to go forward while still addressing the concerns of the Attorney General and the Sierra Club, the Parties have agreed to resolve their dispute by agreement, without the need for judicial resolution.

The parties want to ensure that the General Plan and the City's implementing actions address GHG reduction in a meaningful and constructive manner. The parties recognize that development on the urban fringe of the City must be carefully balanced with accompanying infill development to be consistent with the state mandate of reducing GHG emissions, since unbalanced development will cause increased driving and increased motor vehicle GHG emissions. Therefore, the parties want to promote balanced development, including adequate infill development, downtown vitalization, affordable housing, and public transportation. In addition, the parties want to ensure that development on the urban fringe is as revenue-neutral to the City as to infrastructure development and the provision of services as possible.

In light of all the above considerations, the Parties agree as follows, recognizing that any legislative actions contemplated by the Agreement require public input and, in some instances, environmental review prior to City Council actions, which shall reflect such input and environmental information, pursuant to State law:

AGREEMENT

Climate Action Plan

1. Within 24 months of the signing of this Agreement, and in furtherance of General Plan Policy HS-4.20 and other General Plan policies and goals, the City agrees that its staff shall prepare and submit for City Council adoption, a Climate Action Plan, either as a separate element of the General Plan or as a component of an existing General Plan element. The Climate Action Plan, whose adoption will be subject to normal requirements for compliance with CEQA and other controlling state law, shall include, at least, the measures set forth in paragraphs 3 through 8, below.

2. The City shall establish a volunteer Climate Action Plan advisory committee to assist the staff in its preparation and implementation of the Plan and other policies or documents to be adopted pursuant to this Agreement. This committee shall monitor the City's compliance with this Agreement, help identify funding sources to implement this Agreement, review in a timely manner all draft plans and policy statements developed in accordance with this Agreement (including studies prepared pursuant to Paragraph 9, below), and make recommendations to the Planning Commission and City Council regarding its review. The committee shall be comprised of one representative from each of the following interests: (1) environmental, (2) non-profit community organization, (3) labor, (4) business, and (5) developer. The committee members shall be selected by the City Council within 120 days of the Effective Date, and shall serve a one-year term, with no term limits. Vacancies shall be filled in accordance with applicable City policies. The City shall use its best efforts to facilitate the committee's work using available staff resources.

3. The Climate Action Plan shall include the following measures relating to GHG inventories and GHG reduction strategies:

a. Inventories from all public and private sources in the City:

(1) Inventory of current GHG emissions as of the Effective Date;

(2) Estimated inventory of 1990 GHG emissions;

(3) Estimated inventory of 2020 GHG emissions.

The parties recognize that techniques for estimating the 1990 and 2020 inventories are imperfect; the City agrees to use its best efforts, consistent with methodologies developed by ICLEI and the California Air Resources

Board, to produce the most accurate and reliable inventories it can without disproportionate or unreasonable staff commitments or expenditures.

b. Specific targets for reductions of the current and projected 2020 GHG emissions inventory from those sources of emissions reasonably attributable to the City's discretionary land use decisions and the City's internal government operations. Targets shall be set in accordance with reduction targets in AB 32, other state laws, or applicable local or regional enactments addressing GHG emissions, and with Air Resources Board regulations and strategies adopted to carry out AB 32, if any, including any local or regional targets for GHG reductions adopted pursuant to AB 32 or other state laws. The City may establish goals beyond 2020, consistent with the laws referenced in this paragraph and based on current science.

c. A goal to reduce per capita vehicle miles traveled ("VMT") attributable to activities in Stockton (i.e., not solely due to through trips that neither originate nor end in Stockton) such that the rate of growth of VMT during the General Plan's time frame does not exceed the rate of population growth during that time frame. In addition, the City shall adopt and carry out a method for monitoring VMT growth, and shall report that information to the City Council at least annually. Policies regarding VMT control and monitoring that the City shall consider for adoption in the General Plan are attached to this Agreement in Exhibit A.

d. Specific and general tools and strategies to reduce the current and projected 2020 GHG inventories and to meet the Plan's targets for GHG reductions by 2020, including but not limited to the measures set out in paragraphs 4 through 8, below.

4. The City agrees to take the following actions with respect to a green building program:

a. Within 12 months of the Effective Date, the City staff shall submit for City Council adoption ordinance(s) that require:

(1) All new housing units to obtain Build It Green certification, based on then-current Build It Green standards, or to comply with a green building program that the City after consultation with the Attorney General, determines is of comparable effectiveness;

(2) All new non-residential buildings that exceed 5000 square feet and all new municipal buildings that exceed 5000 square feet to be certified to LEED Silver standards at a minimum, based on the then-current LEED standards, or to comply with a green building program that the City, after consultation with the Attorney General, determines is of comparable effectiveness;

(3) If housing units or non-residential buildings certify to standards other than, but of comparable effectiveness to, Build It Green or LEED Silver, respectively, such housing units or buildings shall demonstrate, using an outside inspector or verifier certified under the California Energy Commission Home Energy Rating System (HERS), or a comparably certified verifier, that they comply with the applicable standards.

(4) The ordinances proposed for adoption pursuant to paragraphs (1) through (3) above may include an appropriate implementation schedule, which, among other things, may provide that LEED Silver requirements (or standards of comparable effectiveness) for non-residential buildings will be implemented first for buildings that exceed 20,000 square feet, and later for non-residential buildings that are less than 20,000 and more than 5,000 square feet.

(5) Nothing in this section shall affect the City's obligation to comply with applicable provisions of state law, including the California Green Building Standards Code (Part 11 of Title 24 of the California Code of Regulations), which, at section 101.7, provides, among other things, that "local government entities retain their discretion to exceed the standards established by [the California Green Building Standards Code]."

b. Within 18 months of the Effective Date, the City staff shall submit for City Council adoption ordinance(s) that will require the reduction of the GHG emissions of existing housing units on any occasion when a permit to make substantial modifications to an existing housing unit is issued by the City.

c. The City shall explore the possibility of creating a local assessment district or other financing mechanism to fund voluntary actions by owners of commercial and residential buildings to undertake energy efficiency

measures, install solar rooftop panels, install "cool" (highly reflective) roofs, and take other measures to reduce GHG emissions.

d. The City shall also explore the possibility of requiring GHG-reducing retrofits on existing sources of GHG emissions as potential mitigation measures in CEQA processes.

e. From time to time, but at least every five years, the City shall review its green building requirements for residential, municipal and commercial buildings, and update them to ensure that they achieve performance objectives consistent with those achieved by the top (best-performing) 25% of city green building measures in the state.

5. Within 12 months of the Effective Date, the City staff shall submit for City Council adoption a transit program, based upon a transit gap study. The transit gap study shall include measures to support transit services and operations, including any ordinances or general plan amendments needed to implement the transit program. These measures shall include, but not be limited to, the measures set forth in paragraphs 5.b. through 5.d. In addition, the City shall consider for adoption as part of the transit program the policy and implementation measures regarding the development of Bus Rapid Transit ("BRT") that are attached to this Agreement in Exhibit B.

a. The transit gap study, which may be coordinated with studies conducted by local and regional transportation agencies, shall analyze, among other things, strategies for increasing transit usage in the City, and shall identify funding sources for BRT and other transit, in order to reduce per capita VMT throughout the City. The study shall be commenced within 120 days of the Effective Date.

b. Any housing or other development projects that are (1) subject to a specific plan or master development plan, as those terms are defined in §§ 16-540 and 16-560 of the Stockton Municipal Code as of the Effective Date (hereafter "SP" or "MDP"), or (2) projects of statewide, regional, or areawide significance, as defined by the CEQA Guidelines (hereafter "projects of significance"), shall be configured, and shall include necessary street design standards, to allow the entire development to be internally accessible by vehicles, transit, bicycles, and pedestrians, and to allow access to adjacent neighborhoods and developments by all such modes of transportation.

c. Any housing or other development projects that are (1) subject to an SP or MDP, or (2) projects of significance, shall provide financial and/or other

support for transit use. The imposition of fees shall be sufficient to cover the development's fair share of the transit system and to fairly contribute to the achievement of the overall VMT goals of the Climate Action Plan, in accordance with the transit gap study and the Mitigation Fee Act (Government Code section 66000, *et seq.*), and taking into account the location and type of development. Additional measures to support transit use may include dedication of land for transit corridors, dedication of land for transit stops, or fees to support commute service to distant employment centers the development is expected to serve, such as the East Bay. Nothing in this Agreement precludes the City and a landowner/applicant from entering in an agreement for additional funding for BRT.

d. Any housing or other development projects that are (1) subject to an SP or MDP or (2) projects of significance, must be of sufficient density overall to support the feasible operation of transit, such density to be determined by the City in consultation with San Joaquin Regional Transit District officials.

6. To ensure that the City's development does not undermine the policies that support infill and downtown development, within 12 months of the Effective Date, the City staff shall submit for City Council adoption policies or programs in its General Plan that:

a. Require at least 4400 units of Stockton's new housing growth to be located in Greater Downtown Stockton (defined as land generally bordered by Harding Way, Charter Way (MLK), Pershing Avenue, and Wilson Way), with the goal of approving 3,000 of these units by 2020.

b. Require at least an additional 14,000 of Stockton's new housing units to be located within the City limits as they exist on the Effective Date ("existing City limits").

c. Provide incentives to promote infill development in Greater Downtown Stockton, including but not limited to the following for proposed infill developments: reduced impact fees, including any fees referenced in paragraph 7 below; lower permit fees; less restrictive height limits; less restrictive setback requirements; less restrictive parking requirements; subsidies; and a streamlined permitting process.

d. Provide incentives for infill development within the existing City limits but outside Greater Downtown Stockton and excluding projects of significance. These incentives may be less aggressive than those referenced in paragraph 6.c., above.

7. Within 12 months of the Effective Date, the City staff shall submit for City Council adoption amendments to the General Plan to ensure that development at the City's outskirts, particularly residential, village or mixed use development, does not grow in a manner that is out of balance with development of infill. These proposed amendments shall include, but not be limited to, measures limiting the granting of entitlements for development projects outside the existing City limits and which are (1) subject to an SP or MDP, or (2) projects of significance, until certain criteria are met. These criteria shall include, at a minimum:

a. Minimum levels of transportation efficiency, transit availability (including BRT) and Level of Service, as defined by the San Joaquin Council of Government regulations, City service capacity, water availability, and other urban services performance measures;

b. Firm, effective milestones that will assure that specified levels of infill development, jobs-housing balance goals, and GHG and VMT reduction goals, once established, are met before new entitlements can be granted;

c. Impact fees on new development, or alternative financing mechanisms identified in a project's Fiscal Impact Analysis and/or Public Facilities Financing Plan, that will ensure that the levels and milestones referenced in paragraphs 7.a. and 7.b., above, are met. Any such fees:

(1) shall be structured, in accordance with controlling law, to ensure that all development outside the infill areas within existing City limits is revenue-neutral to the City (which may necessitate higher fees for development outside this area, depending upon the costs of extending infrastructure);

(2) may be in addition to mitigation measures required under CEQA;

(3) shall be based upon a Fiscal Impact Analysis and a Public Facilities Financing Plan.

d. The City shall explore the feasibility of enhancing the financial viability of infill development in Greater Downtown Stockton, through the use of such mechanisms as an infill mitigation bank.

8. The City shall regularly monitor the above strategies and measures to ensure that they are effectively reducing GHG emissions. In addition to the City staff reporting on VMT annually, as provided in paragraph 3.c., the City staff or the advisory committee shall report annually to the City Council on the City's progress in implementing the

strategies and measures of this Agreement. If it appears that the strategies and measures will not result in the City meeting its GHG reduction targets, the City shall, in consultation with the Attorney General and Sierra Club, make appropriate modifications and, if necessary, adopt additional measures to meet its targets.

Early Climate Protection Actions

9. To more fully carry out those provisions of the General Plan, including the policy commitments embodied in those General Plan Policies, such as General Plan Policy HS-4.20, intended to reduce greenhouse gas emissions through reducing commuting distances, supporting transit, increasing the use of alternative vehicle fuels, increasing efficient use of energy, and minimizing air pollution, and to avoid compromising the effectiveness of the measures in Paragraphs 4 through 8, above, until such time as the City formally adopts the Climate Action Plan, before granting approvals for development projects (1) subject to an SP or MDP, or (2) considered projects of significance, and any corresponding development agreements, the City shall take the steps set forth in subsections (a) through (d) below:

(a) City staff shall:

(1) formulate proposed measures necessary for the project to meet any applicable GHG reduction targets;

(2) assess the project's VMT and formulate proposed measures that would reduce the project's VMT;

(3) assess the transit, especially BRT, needs of the project and identify the project's proposed fair share of the cost of meeting such needs;

(4) assess whether project densities support transit, and, if not, identify proposed increases in project density that would support transit service, including BRT service;

(5) assess the project's estimated energy consumption, and identify proposed measures to ensure that the project conserves energy and uses energy efficiently;

(6) formulate proposed measures to ensure that the project is consistent with a balance of growth between land within Greater Downtown Stockton and existing City limits, and land outside the existing City limits;

(7) formulate proposed measures to ensure that City services and infrastructure are in place or will be in place prior to the issuance of new entitlements for the project or will be available at the time of development; and

(8) formulate proposed measures to ensure that the project is configured to allow the entire development to be internally accessible by all modes of transportation.

(b) The City Council shall review and consider the studies and recommendations of City staff required by paragraph 9(a) and conduct at least one public hearing thereon prior to approval of the proposed project (though this hearing may be folded into the hearing on the merits of the project itself).

(c) The City Council shall consider the feasibility of imposing conditions of approval, including mitigation measures pursuant to CEQA, based on the studies and recommendations of City staff prepared pursuant to paragraph 9(a) for each covered development project.

(d) The City Council shall consider including in any development approvals, or development agreements, that the City grants or enters into during the time the City is developing the Climate Action Plan, a requirement that all such approvals and development agreements shall be subject to ordinances and enactments adopted after the effective date of any approvals of such projects or corresponding development agreements, where such ordinances and enactments are part of the Climate Action Plan.

(e) The City shall complete the process described in paragraphs (a) through (d) (hereinafter, "Climate Impact Study Process") prior to the first discretionary approval for a development project. Notwithstanding the foregoing, however, for projects for which a draft environmental impact report has circulated as of the Effective Date, the applicant may request that the City either (i) conduct the Climate Impact Study Process or (ii) complete its consideration of the Climate Action Plan prior to the adoption of the final discretionary approval leading to the project's first phase of construction. In such cases, the applicant making the request shall agree that nothing in the discretionary approvals issued prior to the final discretionary approval (i) precludes the City from imposing on the project conditions of approvals or other measures that may result from the Climate Impact Study Process, or (ii) insulates the project from a decision, if any, by the City to apply any ordinances and/ or enactments that may comprise the Climate Action Plan

ultimately adopted by the City.

Attorney General Commitments

10. The Attorney General enters into this Agreement in his independent capacity and not on behalf of any other state agency, commission, or board. In return for the above commitments made by the City, the Attorney General agrees:

a. To refrain from initiating, joining, or filing any brief in any legal challenge to the General Plan adopted on December 11, 2007;

b. To consult with the City and attempt in good faith to reach an agreement as to any future development project whose CEQA compliance the Attorney General considers inadequate. In making this commitment, the Attorney General does not surrender his right and duties under the California Constitution and the Government Code to enforce CEQA as to any proposed development project, nor his duty to represent any state agency as to any project;

c. To make a good faith effort to assist the City in obtaining funding for the development of the Climate Action Plan.

Sierra Club Commitments

11. The Sierra Club agrees to dismiss the Sierra Club Action with prejudice within ten (10) days of the Effective Date. Notwithstanding the foregoing agreement to dismiss the Sierra Club Action, the City and Sierra Club agree that, in the event the City should use the EIR for the 2035 General Plan in connection with any other project approval, the Sierra Club has not waived its right (a) to comment upon the adequacy of that EIR, or (b) to file any action challenging the City's approval of any other project based on its use and/or certification of the EIR.

General Terms and Conditions

12. This Agreement represents the entire agreement of the Parties, and supercedes any prior written or oral representations or agreements of the Parties relating to the subject matter of this Agreement.

13. No modification of this Agreement will be effective unless it is set forth in writing and signed by an authorized representative of each Party.

14. Each Party warrants that it has the authority to execute this Agreement. Each Party warrants that it has given all necessary notices and has obtained all necessary consents to permit it to enter into and execute this Agreement.

15. This Agreement shall be governed by and construed in accordance with the laws of the State of California.

16. This Agreement may be executed in counterparts, each of which shall be deemed an original. This Agreement will be binding upon the receipt of original, facsimile, or electronically communicated signatures.

17. This Agreement has been jointly drafted, and the general rule that it be construed against the drafting party is not applicable.

18. If a court should find any term, covenant, or condition of this Agreement to be invalid or unenforceable, the remainder of the Agreement shall remain in full force and effect.

19. The City agrees to indemnify and defend the Sierra Club, its officers and agents (collectively, "Club") from any claim, action or proceeding ("Proceeding") brought against the Club, whether as defendant/respondent, real party in interest, or in any other capacity, to challenge or set aside this Agreement. This indemnification shall include (a) any damages, fees, or costs awarded against the Club, and (b) any costs of suit, attorneys' fees or expenses incurred in connection with the Proceeding, whether incurred by the Club, the City or the parties bringing such Proceeding. If the Proceeding is brought against both the Club and the City, the Club agrees that it may be defended by counsel for the City, provided that the City selects counsel that is acceptable to the Club; the Club may not unreasonably withhold its approval of such mutual defense counsel.

20. The City shall pay Sierra Club's attorney's fees and costs in the amount of $157,000 to the law firm of Shute, Mihaly & Weinberger LLP as follows: $50,000 within 15 days of dismissal of the Sierra Club Action, and (b) the balance on or before January 30, 2009.

21. Any notice given under this Agreement shall be in writing and shall be delivered as follows with notice deemed given as indicated: (a) by personal delivery when delivered personally; (b) by overnight courier upon written verification of receipt; or (c) by certified or registered mail, return receipt requested, upon verification of receipt. Notice shall be sent as set forth below, or as either party may specify in writing:

City of Stockton: Attorney General's Office

Richard E. Nosky, City Attorney
425 N. El Dorado Street, 2nd Floor
Stockton, CA 95202

Lisa Trankley
Susan Durbin
Deputy Attorneys General
1300 I Street, P.O. Box 944255
Sacramento, CA 94255-2550

Sierra Club:
Aaron Isherwood
Environmental Law Program
85 Second Street, 2nd Floor
San Francisco, CA 94105

Rachel Hooper
Amy Bricker
Shute, Mihaly & Weinberger
396 Hayes Street
San Francisco, CA 94102

22. Nothing in this Agreement shall be construed as requiring the City to relinquish or delegate its land use authority or police power.

(SIGNATURES ON FOLLOWING PAGE)

In witness whereof, this Agreement is executed by the following:

PEOPLE OF THE STATE OF CALIFORNIA
BY AND THROUGH ATTORNEY GENERAL
EDMUND G. BROWN JR.

Lisa Trankley

DATED: 10/14/08

ATTEST:

KATHERINE GONG MEISSNER
City Clerk of the City of Stockton

CITY OF STOCKTON,
a municipal corporation

J. GORDON PALMER, JR.
City Manager

DATED 9/25/08

APPROVED AS TO FORM:

RICHARD E. NOSKY, JR.
City Attorney

DATED 9-9-08

THE SIERRA CLUB

BARBARA WILLIAMS, CHAIR
MOTHER LODE CHAPTER

DATED _____

In witness whereof, this Agreement is executed by the following:

PEOPLE OF THE STATE OF CALIFORNIA
BY AND THROUGH ATTORNEY GENERAL
EDMUND G. BROWN JR.

_____

DATED: _____

ATTEST:

KATHERINE GONG MEISSNER
City Clerk of the City of Stockton

CITY OF STOCKTON,
a municipal corporation

J. GORDON PALMER, JR.
City Manager

DATED _____

APPROVED AS TO FORM:

RICHARD E. NOSKY, JR.
City Attorney

DATED _____

THE SIERRA CLUB



BARBARA WILLIAMS, CHAIR
MOTHER LODE CHAPTER

DATED 10/11/08

EXHIBIT A

Policy Re: VMT Monitoring Program

The City's policy is to monitor key City-maintained roadways to estimate Vehicle Miles Traveled (VMT) by single-occupant automobile per capita on an annual basis, to be submitted as an annual report to the City Council. The estimate of citywide VMT should be developed in cooperation with the San Joaquin Council of Governments (**"**SJCOG**"**), by augmenting local City data with VMT estimates from SJCOG and Caltrans for the regional Congestion Management Plan network. The estimated change in annual VMT should be used to measure the effectiveness of jobs/housing balance, greenhouse gas emission reduction, and transit plans and programs.

Implementation Program

In order to develop an annual estimate of citywide VMT, the City should augment local City data with VMT estimates from SJCOG and Caltrans for regional facilities, or adopt other methodologies to estimate citywide VMT that are approved in concept by the two agencies. For purposes of calculating annual changes in VMT, the annual estimate of VMT should subtract out the estimates of regional truck and other through traffic on the major freeways (I-5, SR 4, SR 99).

Policy Re: Reduce Growth in VMT

The City's policy is to achieve the following fundamental goals to regulate vehicle emissions and reduce greenhouse gas emissions, improve jobs/housing balance, and increase transit usage over the duration of this General Plan: Reduce the projected increase in VMT by single-occupant automobile per capita to an annual rate over the planning period that is equal to or less than the population increase (this goal is also required for the City to receive funding through the Measure K/Congestion Management Plan program).

Implementation Program

In order to keep annual increases in VMT to a rate equal to or less than population increases, the following trip reduction programs should be considered by the City: increased transit service (Bus Rapid Transit) funded through new development fees; planning all future housing development to be in the closest possible proximity to existing and planned employment centers; provision of affordable housing; creation of higher density, mixed use and walkable communities and development of bicycle and pedestrian trails; and other proven programs.

Implementation Program

If the City goal of reducing the projected increase in VMT to an amount equal to or less than the population increase, and increase transit usage, is not met for two or more years during each five-year cycle of VMT monitoring, the City should consider adoption of the following programs, among others:

Adopt more vigorous economic development programs with funding for staff; and

Slow the rate of approvals of building permits for housing developments.

EXHIBIT B

Policy Re: Bus Rapid Transit

The City's policy is to vigorously support efforts to develop Bus Rapid Transit (BRT) within and beyond Stockton as a major priority of its General Plan, in order to increase overall transit usage over time. Based on an updated transit study, the City should plan for and provide BRT service running along key north-south routes as a first priority: Pacific Avenue; El Dorado Street; West Lane/Airport Way; Pershing Avenue. BRT service along key east-west corridors should also be provided. Transit use goals should be approved and monitored by the City over the planning period.

Implementation Program

In order to fund the initial capital and operating costs for BRT along major north-south arterials, the City should consider adoption of a comprehensive new development BRT fee program that requires new growth to significantly fund BRT, following a study consistent with the requirements of State law. The new development BRT fee program should ensure that "greenfield" projects approved at the fringe of the City pay a fee that represents the full cost of providing BRT service to the new housing; infill development may be granted a reduced BRT fee based on the reduced distance of service provided to the inner city areas.

Implementation Program

In order to augment the new development funding of the initial capital and operating costs for BRT, the City should strongly advocate for Measure K funding and should seriously consider placing an initiative on the ballot to receive voter approval for additional funding from existing residents and businesses.

Implementation Program

The City should establish transit use goals that set specific targets (e.g., transit mode split percentage of total trips and bus headways) that represent an increase in public transportation ridership and level of service over current levels by 2012 and then another increase by 2018.

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CITY OF STOCKTON

OFFICE OF THE CITY MANAGER
City Hall • 425 N. El Dorado Street • Stockton, CA 95202-1997 • 209/937-8212 • Fax 209/937-7149
www.stocktongov.com

October 7, 2008

Alliance for Responsible Planning
6507 Pacific Avenue
Box 339
Stockton, CA 95207

SETTLEMENT AGREEMENT WITH ATTORNEY GENERAL AND SIERRA CLUB

As you are aware, on September 9, 2008, the City of Stockton approved a Memorandum of Agreement with the Sierra Club and the California Attorney General's Office resolving litigation over the City's 2035 General Plan. The Alliance for Responsible Planning and other interested parties have raised questions about the parties' interpretation of the Agreement and the public process that the City plans to follow in carrying out the Agreement. To help answer these questions, below we clarify our interpretation of the Agreement and also elaborate on the public process that the City will follow in implementing the provisions of the Agreement. We understand that the other parties to the Agreement concur in these views. Note that many of the statements below reiterate points that were made in the City's Resolution adopted in connection with its approval of the Agreement and in statements made by the parties during the August 26, 2008, and September 9, 2008, City Council hearings about the Agreement:

1. The parties understand and acknowledge the importance of public involvement in the process of developing the General Plan, and encourage the continued significant involvement of the public in the development of greenhouse gas reduction polices. The City intends to provide for public involvement in the development of the programs, policies, General Plan amendments and ordinances proposed by the Agreement. The City also will provide reasonable notification to the public of all Advisory Committee, Planning Commission and City Council meetings involving consideration of the issues provided for by the Agreement. It is the City's expectation to expand the composition of the Climate Action Advisory Committee to include a total of two representatives from each of the following interests: (1) environmental, (2) non-profit community organization, (3) labor, (4) business, and (5)

Stockton
All-America City
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1999

developer. The City will fully comply with CEQA in connection with the development of the programs, policies, General Plan amendments and ordinances proposed by the Agreement.

2. The parties understand and acknowledge that the public review process and compliance with CEQA may require additional time beyond designated time periods to ensure the full involvement of the public in the consideration of the Climate Action Plan, green building program and transit study and to ensure full compliance with CEQA.

3. The parties understand and acknowledge that the adoption of the programs, policies, General Plan amendments and ordinances proposed by the Agreement are discretionary legislative acts and the City is not required by the terms of the Agreement to adopt any particular program, policy, General Plan amendment or ordinance. In addition, nothing in the Agreement shall limit or restrict the right of the City to modify, alter, or rescind any particular program, policy, General Plan amendment or ordinance following the adoption of such program, policy, General Plan amendment or ordinance. Although the Agreement requires City staff to present to the City Council certain programs, policies, General Plan Amendments and ordinances for its consideration, nothing in the Agreement limits or restricts City staff from providing to the City Council additional, alternative recommendations for such programs, policies, General Plan amendments and ordinances based on staff professional judgment, public input and CEQA review.

4. The parties understand and acknowledge that if there is an instance in which the terms of the written Agreement are unclear, the Resolution adopted by the City Council on September 9, 2008, and the statements made by the Attorney General's office, the Sierra Club and our City Attorney and the City's outside counsel at the August 26 and September 9, 2008, City Council hearings provide a legislative history pursuant to which the Agreement should be interpreted.

5. The parties understand and acknowledge that:
   (i) upon consideration of a Climate Action Plan (CAP) by the Council, the City's obligations under Agreement paragraphs 3 through 7 will be discharged,
   (ii) upon adoption of a CAP, the City's obligations under Agreement paragraph 9 will be discharged, and
   (iii) upon inclusion of a program in the CAP to regularly monitor and, if appropriate, modify the City's strategies and measures to meet the Greenhouse Gas reduction targets that may be adopted in the

CAP, the City's obligations under paragraph 8 will be discharged. Nothing in this paragraph 5 is intended to contradict our clarification in paragraph 3, above, that the City retains full legislative discretion with respect to any policies, programs and ordinance it may adopt as part of a CAP.

J. GORDON PALMER, JR.
CITY MANAGER

JGP:REN:cn

cc: Edward J. Chavez
Richard E. Nosky, Jr.
George Mihlsten (Via e-mail)
Cliff Rechtschaffen (Via e-mail)
Rachel Hooper (Via e-mail)

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EDMUND G. BROWN JR.
Attorney General

State of California
DEPARTMENT OF JUSTICE

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October 7, 2008

Alliance for Responsible Planning
6507 Pacific Avenue
Box 339
Stockton, CA 95207

RE: Stockton General Plan Settlement
Clarification Letters

Dear Alliance Members:

The Attorney General's Office has read the letter from Stockton City Manager Gordon Palmer to the Alliance for Responsible Planning (copy attached). We concur in the City's interpretation and understanding of the Memorandum of Agreement as set forth in the letter.

If you have questions, please contact the undersigned.

Sincerely,

CLIFF RECHTSCHAFFEN
Special Assistant Attorney General

For EDMUND G. BROWN JR.
Attorney General

SHUTE, MIHALY & WEINBERGER LLP
ATTORNEYS AT LAW

E. CLEMENT SHUTE, JR.*
MARK I. WEINBERGER (1948-2005)
FRAN M. LAYTON
RACHEL B. HOOPER
ELLEN J. GARBER
TAMARA S. GALANTER
ANDREW W. SCHWARTZ
ELLISON FOLK
RICHARD S. TAYLOR
WILLIAM J. WHITE
ROBERT S. PERLMUTTER
OSA L. WOLFF
MATTHEW D. ZINN
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ERIN B. CHALMERS

LAUREL L. IMPETT, AICP
CARMEN J. BORG, AICP
URBAN PLANNERS

October 7, 2008

Via U.S. Mail

Alliance for Responsible Planning
6507 Pacific Avenue
Box 339
Stockton, CA 95207

Re: Stockton General Plan Settlement
Clarification Letters

Dear Alliance:

On behalf of the Sierra Club, we have read the letter from Stockton City Manager Gordon Palmer to the Alliance for Responsible Planning (copy attached). The Sierra Club concurs in the City's interpretation and understanding of the Memorandum of Agreement as set forth in the letter.

SHUTE, MIHALY, & WEINBERGER LLP

Yours very truly,

Rachel B. Hooper

Rachel B. Hooper

Enclosure
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Alliance for Responsible Planning

8507 Pacific Avenue
Box 338
Stockton, CA 95207

October 7, 2008

Honorable Mayor Ed Chavez and City Councilmembers
425 N. El Dorado St, 2nd Floor
Stockton, CA 95202

Honorable Mayor and Councilmembers:

We are pleased to receive a copy of a letter from Gordon Palmer, City Manager, outlining a series of clarifications regarding the Memorandum of Agreement entered into by the City with the Attorney General and the Sierra Club. The letter from Mr. Palmer sets forth important clarifications to the Agreement which have been concurred in by the Attorney General and the Sierra Club.

These clarifications provide clear assurances to the Alliance and the public as to a number of critical issues that have been of concern to the Alliance. In particular, the letter makes very clear the importance of significant public involvement in the consideration of a Climate Action Plan. We strongly support the possible expansion of the number of members of the proposed Advisory Committee and look forward to participating in that process.

In addition, the Alliance agrees that alternative recommendations can be presented to the City Council based on public input and the California Environmental Quality Act. This helps to ensure the credibility of the public process. Lastly, the letter underscores the clear understanding of the parties to the Agreement that the adoption of a Climate Action Plan is in the legislative discretion of the City.

In light of the discussions undertaken in good faith among the parties and the Alliance, the statements made in Mr. Palmer's letter, and the concurrence of the Attorney General and the Sierra Club to the letter from the City Manager, we have decided to withdraw our effort to seek a referendum of the Agreement pursuant to the authorization contained in Section 9604 of the Elections Code. These statements by the City and the other parties address the core issues we have heard from the community. In accordance with section 9604, we will provide written notice to the City Clerk of the withdrawal of the referendum. In addition, we will not be pursuing a legal challenge to the adoption of the Agreement by the City nor will we promote or fund any individuals or entities challenging the adoption of the Agreement or promoting a referendum of the Agreement. We, of course, reserve our rights to challenge the implementation of the Agreement.

We are proud of the 25,000 Stocktonians who participated in this process. We thank the City Manager, the City Attorney, the Attorney General and the Sierra Club for providing these clarifications. It is sincerely appreciated.

We look forward to working with the City and the community in undertaking development of a Climate Action Plan. In addition, the Alliance looks forward to continuing to work with the community and the City on other issues affecting the City's future.

Sincerely,

Gary Podesto

A.G. Spanos Companies

October 7, 2008

Honorable Mayor Ed Chavez and Councilmembers
425 N. El Dorado St., 2nd Floor
Stockton, CA 95202

Honorable Mayor and Councilmembers:

We have had a chance to review the letter from the City Manager dated October 7, 2008 and letters from the Attorney General and the Sierra Club. These letters provide a number of critical clarifications with respect to the Memorandum of Agreement approved by the City on September 9, 2008.

In particular:

- All parties have recognized the need for significant community involvement in the consideration of a Climate Action Plan. The A. G. Spanos Companies strongly supports the City's stated expectation to expand the number of members of the proposed Advisory Committee, and we look forward to participating in that process.
- Second, all parties have it clear that alternative recommendations can be presented to the City Council based on public input and the California Environmental Quality Act. This helps to ensure the credibility of the public process.
- Finally, all parties to the Agreement acknowledge that the adoption of a Climate Action Plan is in the legislative discretion of the City.

In light of these statements by Mr. Palmer and the concurrence of the other parties regarding a significant public process and assurances regarding the independent discretion of the City in developing and considering a Climate Action Plan, we will not be pursuing a legal challenge to the adoption of the Agreement by the City and will not fund or support any efforts by any other individuals or entities to file a legal challenge to the adoption of the Agreement or to seek a referendum with regard to the adoption of the Agreement. We, of course, reserve our rights to challenge the implementation of the Agreement.

We look forward to working with the community and the City in developing a Climate Action Plan. We are prepared to work with the City and the Alliance to develop a comprehensive public outreach program to ensure the community's significant involvement in the process.

Sincerely,

David Nelson
A.G. Spanos Companies

10100 Trinity Parkway, 5th Floor Stockton, California 95219 Telephone: 209.478.7954 Fax: 209.478.3309

Appendix B

Greenhouse Gas Inventory Methodology

Appendix B
Greenhouse Gas Inventory Methodology

Introduction

In order to develop a Climate Action Plan (CAP) for the City of Stockton (City), a baseline greenhouse gas (GHG) emissions inventory must first be established. The City previously prepared a draft 1990 emissions backcast, 2005 community GHG inventory, and 2020 emissions forecast. Since development of the draft inventories, additional guidance and modeling methodologies have been adopted by relevant state and federal agencies.[1] This memorandum presents revised GHG inventories that have been updated to be consistent with the most recent state and federal guidance. The revised GHG inventories, once approved by the City, will ultimately be incorporated into the City's CAP.

Report Organization

This memoriam summarizes the methods used to develop the 1990 backcast, 2005 GHG inventory, and 2020 business-as-usual (BAU) forecast. General concepts and terminology that are used throughout the document are defined in Section 1.2. An overview of the inventory background, including a summary of the draft GHG inventories previously prepared by the City, is presented in Section 2. Methods used to quantify emissions for each sector are presented in Section 3. Finally, the inventory results are discussed in Section 4.

General Concepts and Terminology

This section briefly defines key inventory terms and concepts used throughout this document.

1990 Backcast. The backcast is an estimate of community emissions in 1990, based on 2005 baseline emissions and projected backward to 1990 using socioeconomic factors.

Assembly Bill 32 (AB 32): The California Global Warming Solutions Act of 2006, widely known as AB 32, requires CARB to develop and enforce regulations for the reporting and verification of Statewide GHG emissions. The heart of the bill is the requirement that statewide GHG emissions must be reduced to 1990 levels by the year 2020, or about 15% from levels at the time of adoption of the AB 32 Scoping Plan[2].

AB 32 Scoping Plan: The Scoping Plan for AB 32 was developed by CARB and approved in December 2008. The plan has a range of GHG reduction actions, which include direct regulations, compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-

[1] As discussed further below, primary guidance used in the preparation of this document includes the California Air Resources Board's (CARB) Local Governments Operations Protocol (LGOP) (2010a), the California Climate Action Registry's (CCAR) General Reporting Protocol (2009), and the Intergovernmental Panel on Climate Change's (IPCC) 2006 Guidelines for National GHG Inventories (2006).

[2] The AB 32 Scoping Plan was developed and approved in 2008. The Scoping Plan recommended that local municipalities adopt a reduction goal of 15% below "current" levels for community and municipal emissions. The Scoping Plan did not identify a specific year as defining "current", but it is thought to be somewhere between 2005 and 2008. For Stockton, 2005 is used as the "current" year.

based mechanisms such as a cap-and-trade system. CARB has already adopted numerous regulations and is currently conducting additional rulemaking for reducing GHG emissions to achieve the emissions cap by 2020.

Business-as-Usual. BAU represents a future scenario that does **not** consider the possible reduction of GHG emissions that may result from any legislation or regulation that would go into effect after the baseline year. The BAU projections are estimates of future emissions based on energy and carbon intensity in the existing economy at the time of the baseline year without considerations of any federal, state, or local reduction measures designed to reduce GHG emissions.

Community Inventory. The community inventory includes GHG emissions occurring in association with the land uses within the City's jurisdictional boundary, and generally consists of sources of emissions that the City's community can influence or control. The inventory includes emissions that occur both inside and outside the jurisdictional boundary, but only to the extent that such emissions are due to land uses within the City.[3]

Emissions Type. GHG emissions can be defined as either *direct* (emissions that occur at the end use location, such as natural gas combustion for building heating) or *indirect* (emissions that result from *consumption* at the end use location but occur at *another* location, such as emissions from residential electricity use that occur at the power plant itself but result from in-home appliance or other use). This report addresses both types of emissions. In this memo, the term *emission* refers to GHG emissions[4] and not to emissions of air quality pollutants.

Unit of Measure. The unit of measure used throughout this GHG inventory is the metric ton (MT) of CO_2 equivalent (CO_2e). Presenting inventories in CO_2e equivalence allows one to characterize the complex mixture of GHG as a single unit taking into account that each gas has a different global warming potential (GWP).[5]

Inventory and Estimate Background

In October 2008, the City approved a Settlement Agreement with the Sierra Club and the California Attorney General's Office to resolve litigation over the City's 2035 General Plan. This agreement was enacted to ensure future growth outlined in the 2035 General Plan addresses GHGs in a meaningful and constructive manner. The agreement requires, among other things, preparation of a CAP that includes the following GHG inventories and estimates for the City's community activities:

- Estimated 1990 GHG emissions (1990 backcast)

[3] Emissions generated by the City's municipal operations (e.g., City-owned facilities, vehicle fleets, school districts) are not individually highlighted in a community GHG inventory. However, emissions generated by the City's municipal operations occurring within the City's jurisdictional boundaries are encapsulated in the overall community emissions inventories. While there is some overlap, municipal emissions represent approximately 2-3% of the City's 2005 community inventory (City of Stockton 2010).

[4] Primary GHGs quantified in this analysis include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

[5] The GWP of CO_2 is, by definition, one (1). The GWP values used in this report are based on the IPCC Second Assessment Report (SAR) and United Nations Framework Convention on Climate Change (UNFCCC) reporting guidelines, and are as follows: CO_2 = 1, CH_4 = 21, N_2O = 310, SF_6 = 23,600 (Intergovernmental Panel on Climate Change 1996, United Nations Framework Convention on Climate Change 2006). Although the IPCC Fourth Assessment Report (AR4) presents different GWP estimates, the current inventory standard relies on SAR GWPs to comply with reporting standards and consistency with regional and national inventories (Intergovernmental Panel on Climate Change 2007; U.S. Environmental Protection Agency 2010a).

- Estimated 2005 GHG emissions (2005 baseline inventory)
- Estimated of 2020 GHG emissions (2020 BAU forecast)

To fulfill these requirements, the City developed a draft community-wide GHG inventory and estimates (hereafter referred to as "existing inventory and estimates") (City of Stockton 2010). The existing inventory and estimates includes an estimate of GHGs from public and private sources for the years 1990, 2005, and 2020. This memorandum presents revised inventory and estimates (hereafter referred to as "revised inventory and estimates") that provides refinements to the existing inventory and estimates, as discussed in Section 2.1.

The 2005 revised inventory defines a baseline from which historic 1990 and future 2020 BAU emissions can be projected. The 2005 inventory was prepared according to the guidelines of the CARB's Local Governments Operations Protocol (LGOP) (2010a). Where the LGOP does not provide adequate guidance for community inventories, other methods consistent with the CCAR's General Reporting Protocol (GRP) (2009) or IPCC 2006 Guidelines for National GHG Inventories (2006) were utilized.[6] The results of the inventory will inform future climate protection initiatives, including the selection of GHG reduction measures.

Consistent with the terms of the Settlement Agreement, a revised 1990 backcast and 2020 BAU forecast were developed for community emissions. The 2020 emissions projection is based on anticipated growth within the City, specific to each inventory sector. Likewise, the 1990 backcast is based on historic data and levels of development. The updated inventory and estimates discussed in this memo will from the foundation of the CAP developed by the City to reduce the regions GHG emissions.

City of Stockton Existing and Revised 2005 Inventory

The revised 2005 inventory is based on the most recent state and federal guidance for quantifying GHG emissions. The key differences between the existing and revised inventories are summarized in Table 1 below. Major differences occur in the transportation sector (the existing inventory used an older model with different trip apportionment methodology), the waste sector (the existing inventory used a different methodology), and the wastewater treatment sector (updated emission factors were used). In addition, the revised inventory includes emissions from three new sectors: agriculture, high GWP GHGs, and off-road equipment.

Table 1. Methodology Comparison of the Existing and Revised 2005 GHG Inventories for the City of Stockton

Emissions Sector	Existing Inventory Methods	Revised Inventory Methods	Main Improvement
On-Road Transportation	Annual vehicles miles traveled (VMT) estimated based on roadway miles in the City.	Emissions based on updated estimates of VMT provided by Fehr & Peers, which incorporate origin-destination information.[a]	New model and VMT generation methodology, which only accounts for VMT the City has direct control over.

[6] This inventory was completed in 2011 before publication of the 2012 ICLEI community inventory protocol. However, the methods used for this inventory are consistent with the 2012 ICLEI protocol.

Emissions Sector	Existing Inventory Methods	Revised Inventory Methods	Main Improvement
Building Energy	Estimates of GHG emissions due to energy consumed by residential, commercial and industrial buildings were based on electricity and natural gas data, available from the energy provider, Pacific Gas and Electric (PG&E)	Existing inventory based on the most recent data. No revisions were made to the 2005 inventory.	None
Solid Waste Management	Landfill emissions and methane commitment estimated using U.S. Environmental Protection Agency's (EPA's) Landfill Gas Emissions Model (LandGEM) and Waste Reduction Model (WARM).	Emissions calculated using historic landfill data obtained from CalRecyle (2010) and the EPA's most recent first order decay (FOD) model	More accurate representation of actual waste-related emissions occurring in the baseline year[b]
Off-Road Equipment	N/A	Emissions from off-road equipment estimated using the OFFROAD2007 model.	Analysis includes all potential emissions sources, consistent with the LGOP
High GWP GHGs	N/A	Replacements for ozone-depleting substances (ODS)[c] and emissions of sulfur hexafluoride (SF_6) from electricity transmission were estimated using 2005 statewide emissions data published by CARB (2010b).	Analysis includes all potential emissions sources, consistent with the LGOP
Wastewater	Process emissions calculated using the CARB's LGOP.	Process and stationary emissions calculated using the CARB's LGOP.	Inclusion of stationary emissions and accurate accounting of process emissions.
Water Importation	Inventory only includes emissions associated with water pumping and treatment (reported in the Building Energy sector)	Includes a new Water sector with emissions from water importation.	More robust analysis of water-related emissions.
Agriculture	N/A	Estimates emission from fertilizer application	Analysis includes all potential emissions sources, consistent with the LGOP

[a] This approach is consistent with the statewide SB 375 Regional Targets Advisory Committee recommendations

[b] The revised inventory is based on historic data rather than a single year of data. Because methane emissions from decay are a function of the amount of material historically deposited at a landfill, this approach provides a more accurate representation of actual waste-related emissions occurring in the baseline year.

[c] Includes hydroflourocarbons (HFCs) and chlorofluorocarbons (CFCs)

Purpose of the Revised Inventory and Estimates

The purpose of the revised inventory and estimates is threefold. First, it serves to update and refine the City's existing inventory to allow for more accurate accounting of GHG emissions. Second, the revised inventory will be used to develop the City's CAP and emissions reduction targets. The interim reduction goal is 15% below 2005 levels by 2020, which is consistent with the requirements of AB 32 and the Settlement Agreement. Third, City officials will be able to identify the major contributing sectors or emissions categories of the City's community emissions. Using this information, specific reduction strategies can be developed and targeted to those sectors with the largest GHG emissions.

Methodology

This section presents the methodology used to prepare the revised baseline 2005 inventory, 1990 backcast, and 2020 BAU forecast. It defines the emissions sectors included in the inventory and estimates, and summarizes the factors used to quantify emissions. Specific analysis methods for each emission sector, including data acquisition and calculations, are also presented. The primary protocols consulted for the analysis are:

- Local Governments Operations Protocol (LGOP) for the quantification and reporting of greenhouse gas emissions inventories (California Air Resources Board 2010a);
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Intergovernmental Panel on Climate Change 2006); and
- 2009 General Reporting Protocol (Version 3.1) for reporting entity-wide GHG emissions (California Climate Action Registry 2009).

Emissions Scopes and Sectors

Scope

CARB's LGOP categorizes community emission sources as Scope 1 (direct), Scope 2 (indirect), and Scope 3 (other indirect). Scope 1 and 2 sources comprise the majority of emissions in a community inventory. The LGOP (2010a) defines emissions scopes as follows:

- **Scope 1**: All direct GHG emissions (with the exception of direct CO_2 emissions from biogenic sources).
- **Scope 2**: Indirect GHG emissions associated with the consumption of purchased or acquired electricity, steam, heating, or cooling.
- **Scope 3**: All other indirect emissions not covered in Scope 2 that are not under the control or influence of the local government.

The revised inventory includes an analysis for all Scope 1 and 2 emissions sources within the City. This is consistent with standard practice, which is to only include Scopes 1 and 2 emissions in community inventories as there is little to no mechanism for a local government to affect Scope 3 emissions.

Sector

The following emissions sectors are included in the inventory/estimates. For each sector, the scope has been identified.

- **On-Road Transportation—Scope 1:** Fuel consumption for on-road vehicles due to the land uses in the City.
- **Building Energy (Residential, Commercial, and Industrial)—Scope 1 and 2:** Natural gas and electricity consumption for the residential, commercial, and industrial sectors. Natural gas emissions are considered Scope 1, while electricity emissions are considered Scope 2.
- **Solid Waste Management—Scope 2:** Methane emissions from waste generated by the community and deposited in landfills.
- **Off-Road Equipment—Scope 1:** Fuel consumption for off-road vehicles and equipment in the City.
- **High GWP GHGs—Scope 1 and 2:** Fugitive emissions of HFCs and CFCs from refrigeration and air conditioning units, as well as SF_6 from the transmission of electricity to the City. Emissions of HFCs and CFCs are considered Scope 1, while emissions for SF_6 are considered Scope 2.
- **Wastewater Treatment—Scope 1:** Process emissions from wastewater treatment, as well as stationary emissions from stationary fuel combustion at the wastewater treatment facility.
- **Water Importation—Scope 2:** Electricity consumption associated with water importation.
- **Agriculture—Scope 1**: N_2O emissions from fertilizer application from farm operations.

Emission Factors

Emission factors and corresponding references used to formulate the City's GHG inventory/estimates are summarized in Table 2. As discussed in the following section, these emission factors were used to calculate GHG emissions from activity data, such as gallons of gasoline combusted.

Table 2. Greenhouse Gas Emission Factors

Source	Emissions Factor	Reference
Energy and Stationary Fuels		
Electricity[a]	0.3809 kg CO_2/kWh	EPA 2010b
	0.000013 kg CH_4/kWh	EPA 2010b
	0.000003 kg N_2O/kWh	EPA 2010b
Gasoline[b]	8.78 kg CO_2/gallon	CCAR 2009
	0.0005 kg CH_4/gallon	CCAR 2009
	0.0002 kg N_2O/gallon	CCAR 2009
Diesel[b]	10.15 kg CO_2/gallon	CCAR 2009
	0.0005 kg CH_4/gallon	CCAR 2009
	0.0002 kg N_2O/gallon	CCAR 2009
Liquefied Petroleum Gasoline[b]	5.79 kg CO_2/gallon	CCAR 2009
	0.001 kg CH_4/gallon	CCAR 2009
	0.001 kg N_2O/gallon	CCAR 2009

Source	Emissions Factor	Reference
Water-Related Energy Intensities[c]		
Surface Water (including Reservoirs)	Importation: 1,510 kWh/MG	CAPCOA 2010
	Treatment: 1,911 kWh/MG	CAPCOA 2010
Ground Water (including the Delta Water Supply Project)	Importation: 896 kWh/MG	CAPCOA 2010
	Treatment: 1,911 kWh/MG	CAPCOA 2010
High Global Warming Potential GHGs[d]		
HFCs and CFCs	0.000334 kg CFC & HFC/person	CARB 2010b
SF_6	0.000028 kg SF_6/person	CARB 2010b

[a] Emission factors are presented in kilograms (kg) of each GHG per kilowatt hour (kWh) of electricity
[b] Emission factors are presented in kg of each GHG per U.S. gallon of fuel. Data obtained from CCAR (2009).
[c] Electricity intensities are presented in kWh of electricity per million gallons (MG) of water. Data obtained from the California Air Pollution Control Officers Association (CAPCOA) (2010)
[d] Emission factors are presented in kg of each GHG per person

Analysis Methods

This section describes the calculation methodology for each emission sector included in the community inventory/estimates. Table 3 briefly summaries the sources for the baseline activity data and the methodology used for backcasting and forecasting emissions to 1990 and 2020, respectively. Attachment 1 contains more detailed information and data considered for several sectors.

Table 3. Summary of Community Inventory/Estimates Data Sources and Methodology

Emissions Sector	Description	Inventory Data Source (2005)	Backcast Methodology (1990)	Projection Methodology (2020)
On-Road Transportation	On-road vehicles fuel combustion	Fehr & Peers 2005 VMT data (Fehr & Peers 2011a)	Fehr & Peers 1990 VMT data (Fehr & Peers 2011a). 1990 EMFAC factors.	Fehr & Peers 2020 VMT data (Fehr & Peers 2011b)
Building Energy	Residential electricity and natural gas consumption	Existing inventory	Reverse growth in households (2005–1990)[a]	Growth in households (2005–2020)
	Commercial electricity and natural gas consumption	Existing inventory	Reverse growth in employment (2005–1990)[a]	Growth in employment (2005–2020)
	Industrial electricity and natural gas consumption	Existing inventory	Reverse growth in employment (2005–1990)[a]	Growth in employment (2005–2020)
Solid Waste Management	Methane emissions from landfilled waste	CalRecycle 2010	Reverse growth in population[b]	Growth in population[b]

Emissions Sector	Description	Inventory Data Source (2005)	Backcast Methodology (1990)	Projection Methodology (2020)
Off-Road Equipment	Off-road vehicle fuel combustion	OFFROAD2007 Model[c]	Reverse growth in employment and population (2005–1990)	Growth in employment and population (2005–2020)
High Global Warming GHGs	Substitutes for ODS and SF_6	CARB 2010b	Reverse growth in population (2005–1990)[d]	Growth in population (2005–2020)
Wastewater	CH_4 and N_2O emissions from the treatment of wastewater and GHG emissions from stationary fuel combustion at the treatment plant	CARB 2010a	Reverse growth in population (2005–1990)	Growth in population (2005–2020)
Water Importation	Indirect electricity emissions for water importation	City of Stockton Staff (Morales pers. comm.)	Linear regression of historic water data (2004–1994)[e]	2020 water consumption projection (Morales pers. comm.)
Agriculture	N_2O from fertilizer use	Miyao pers. comm.; CARB 2008a and 2008b	N/A[f]	N/A[f]

Sources: California Air Resources Board 2010a and 2010b; Fehr & Peers 2011a and 2011b; CalRecycle 2010; Morales pers. comm.

[a] Due to improvements in building efficiency and renewable energy generation, energy consumption and utility-specific emission factors have decreased between 1990 and 2005. Consequently, actual GHG emissions from building energy use in 1990 may be slightly higher than what is quantified by scaling 2005 emissions by City growth forecasts.

[b] Assumes a constant per-capita waste disposal rate (based on 2005 data)

[c] OFFROAD generates emissions estimates at the County-level; emissions were appropriated to the City of Stockton using city-wide employment and population (see Section 3.3.3 for more information)

[d] Use of replacements for ODS was less widespread in 1990 than in 2005. The per capita emission rate in 1990 for HFCs and CFCs is therefore likely lower than the 2005 emission rate. Because 1990 emissions are calculated using the 2005 per capita emission factor, this report likely overestimates emissions of HFCs and CFCs in 1990.

[e] Improvements in renewable energy generation have reduced utility-specific emission rates between 1990 and 2005. Consequently, emissions for the 1990 backcast related to water consumption may be slightly higher than what is presented in this report.

[f] Agricultural activity within the City assumed to remain constant. Please refer to Section 3.3.8 for additional information.

Population, housing, and employment data for 1990, 2005, and 2020 are presented in Table 4. Note that the 2020 data presented in Table 4 differs from what was assumed in the existing inventory. This is because the revised analysis utilizes slightly more recent projections, which account for the economic downturn.

Table 4. Population, Housing, and Employment Data for the City of Stockton

	Value			Factors[a]	
Parameter	1990[b]	2005[c]	2020[d]	1990[e]	2020[f]
Population	210,943	278,515	310,378	0.76	1.11
Housing	72,525	95,375	104,678	0.76	1.10
Employment	79,162	114,318	141,245	0.69	1.24

Notes

[a] For 2020, the projection factor represents the total growth between the 2020 year and the existing year. For example, between 2005 and 2020, population is anticipated to increase by a factor of 1.11. For 1990, the projection factor represents the reverse growth rate between 2005 and 1990.

[b] Based on the 1990 U.S. Census

[c] Based on the 2005 American Communities Survey (U.S. Census)

[d] Calculated by multiplying the 2005 Census values by the projected growth estimated by Fehr & Peers.

[e] Based on 1990 Census and 2005 Census

[f] Based on 2005 Census and Fehr & Peers 2010b

Sources: U.S. Census 1990; U.S. Census 2005; Fehr & Peers 2011b

To estimate emissions generated in 1990 and 2020, baseline emissions were multiplied by the factors summarized in Table 4. For example, emissions generated by residential building energy use in 2005 were multiplied by 0.76 and 1.10 to obtain emissions in 1990 and 2020, respectively. The following analysis provides additional detail on specific factors assumed for each emissions sector.

On-Road Vehicles

On-road transportation emissions were quantified based on estimates of VMT provided by Fehr & Peers (Fehr & Peers 2011a), as well as emission factors and vehicle fleet profiles obtained from CARB's EMFAC emissions model (see Attachment 1). Consistent with the statewide Regional Targets Advisory Committee (RTAC), Fehr & Peers developed baseline VMT using the transportation origin/destination modeling methodology. This methodology calculates daily VMT by five mile per hour speed increments and accounts for the three following types of vehicle trips.

1. Vehicle trips that originated and terminated within the City of Stockton
2. Vehicle trips that either originated or terminated (but not both) within the City
3. Vehicle trips with neither originated or terminated within the City. These trips are commonly called pass-through trips.

Using the "accounting rules" established by the RTAC, VMT from the trips of type 1, 2, and 3 were waited by 1, 0.5, and 0 respectively towards jurisdiction-generated VMT (Fehr & Peers 2011a).

Fehr & Peers developed estimates of 1990 VMT by multiplying the number of households in 1990 by the 2005 household trip rate per household. This approach assumes the average household trip rate remained constant between 1990 and 2005. Based on the analysis, it was calculated that up to

4,216,021 daily vehicle miles were generated in 1990.[7] Speed data by five mile per hour increment was not available for 1990. Consequently, the baseline speed profile was assumed in the emissions calculations. (Fehr & Peers 2011a.)

VMT in 2020 was estimated using an updated version of the City of Stockton Travel Demand Model. The updated model accounts for land use and roadway networks anticipated at the end of 2020. Land use conditions were developed by City staff, based on permit activity between 2005 and 2010 and estimates of new development between 2011 and 2020. Roadway modifications reflect improvement projects completed between 2005 and 2010, as well as those expected for completion by 2020. Based on these revised model inputs, and the "accounting rules" (discussed above), Fehr & Peers calculated 2020 BAU daily VMT by five mile per hour speed increments. (Fehr & Peers 2011b.)

Table 5 summarizes the 1990, 2005, and 2020 VMT data provided by Fehr & Peers. As discussed above, VMT estimates presented in Table 5 were converted to CO_2, CH_4 and N_2O using emission factors and vehicle fleet profiles obtained from the CARB's EMFAC emissions model (Attachment 1).

Table 5. City of Stockton Annual VMT by Five Mile per Hour Speed Bin

Speed Bin (MPH)	1990	2005	2020
0.0 – 4.9	840,714	1,138,435	1,568,040
5.0– 9.9	5,968,824	8,082,560	8,234,400
10.0 – 14.9	12,188,326	16,504,570	25,301,435
15.0 – 19.9	21,574,991	29,215,330	54,826,650
20.0 – 24.9	65,801,809	89,104,165	98,124,775
25.0 – 29.9	201,334,599	272,633,100	271,842,875
30.0 – 34.9	202,651,869	274,416,855	318,752,675
35.0 – 39.9	156,678,394	212,162,820	260,992,520
40.0 – 44.9	119,584,299	161,932,615	229,772,245
45.0 – 49.9	109,722,963	148,579,090	168,946,820
50.0 – 54.9	84,446,837	114,351,945	170,711,230
55.0 – 59.9	251,219,185	340,183,285	298,178,355
60.0 – 64.9	245,760,881	332,792,035	305,698,815
65.0 – 69.9	61,074,244	82,702,430	89,478,655
Total	1,538,847,665	2,083,798,870	2,302,429,855

Building Energy

Building energy consumption includes electricity and natural gas usage in residential, commercial, and industrial buildings. Electricity use results in indirect emissions from the power plants that produce electricity. Natural gas consumption results in direct emissions where the natural gas is combusted.

The existing inventory quantified electricity and natural gas emissions in 2005 using activity data

[7] Note that actual VMT in Stockton may be lower on a per-capita and per-household basis in 1990 than in 2005 given the changes in Stockton commuting patterns between the 1990 and 2000 Census. However, a comparison of the Fehr & Peers VMT estimate to the 1990 Highway Performance Monitoring System (HPMS) indicates that the 1990 VMT estimate of 4,216,021 miles per day is within the likely range of travel generated solely by Stockton land uses in 1990. (Fehr & Peers 2011a.)

obtained from Pacific Gas & Electric Company (PG&E) (see Table 6). PG&E has a third party certified emission factor for CO_2. The factor in 2005 was 489.12 pounds of CO_2 per megawatt-hour (MWh). The existing inventory utilized this factor to quantify CO_2 emissions associated with building energy use. Because PG&E does not have third party certified emission factors for CH_4 and N_2O, the analysis used the emission factors summarized in Table 2 to quantify emissions of these pollutants.

The activity data and the emission factors employed by the existing inventory are still accurate. As such, the building energy inventory estimates are the same for the existing and revised inventories for the year 2005.[8]

Table 6. Electricity and Natural Gas Consumption (2005)

Sector	Electricity (kWh)	Natural Gas (therms)
Residential	633,260,860	38,401,223
Commercial	699,836,120	40,018,337
Industrial	222,230,294	2,098,110
Source: Adapted from City of Stockton (2010) model outputs		

The revised inventory quantifies 1990[9] and 2020 BAU emissions from natural gas and electricity consumption using the most recent City growth forecasts presented in Table 4. For the residential sector, emissions were projected using the growth in households. For the commercial/industrial sector, emissions were projected using the growth in total employment. Note that for 2020, these factors represent a more realistic estimate of 2020 activity, and thus future demand, than what was used in the existing inventory.

Off-Road Equipment

Off-road equipment includes vehicles that do not operate on City or County roadways. Direct emissions of CO_2, CH_4, and N_2O are generated by equipment fuel combustion. CARB's OFFROAD2007 air quality model was used to calculate off-road equipment GHG emissions. Because the model provides county-level data, it was run for the year 2005 to calculate overall emissions for off-road equipment in San Joaquin County (see Attachment 1). Equipment categories were refined to include those activities relevant to the City. The following equipment categories, as defined by the OFFROAD model, were included in the model run based on consultation with City staff: agricultural, construction, dredging, entertainment, industrial, lawn and garden, light commercial, other potable,

[8] The existing inventory includes biogas generated at the wastewater treatment facility in the industrial sector. Because emissions from wastewater treatment were quantified separately below, the revised inventory has removed biogas emissions from the industrial building energy sector. Please refer to Section 3.3.5 for a discussion of biogas emissions.

[9] Due to improvements in building efficiency and renewable energy generation, energy consumption and utility-specific emission factors have decreased between 1990 and 2005. Consequently, actual GHG emissions from building energy use in 1990 may be slightly higher than what is quantified by scaling 2005 emissions by City growth forecasts. Revising the inventory to reflect these caveats is beyond the consultant's scope of work, which was to prepare a 1990 backcast and not a bottom up 1990 inventory. Should the City elect to use 1990 as an emissions goal for their CAP, additional revisions can be made to the building energy sector to better capture changes in energy efficiency and emission rates.

pleasure craft, Railyards, recreational, and transportation refrigeration units.[10]

To obtain city-wide emissions, population and employment statistics were used to apportion the OFFROAD County estimates. Table 7 outlines the scaling factors used in this analysis. Table 7 also lists a rational as to why these factors were selected to represent each equipment category.

Table 7. Off-Road Transportation Equipment and Scaling Factors

Off-Road Equipment	Scaling Factor	Rational
Agricultural	Employment	Equipment use assumed to operate on agricultural fields
Construction	Population	Equipment use assumed to be correlated with population increase
Dredging	Employment	Equipment assumed to operate at port locations
Entertainment	Population	Equipment assumed to be owned by households
Industrial	Employment	Equipment use assumed to operate at manufacturing businesses
Lawn and garden	Population	Equipment assumed to operate on residential, commercial, and industrial landscapes
Light Commercial	Employment	Equipment use assumed to operate at manufacturing businesses
Other potable	Employment	Equipment assumed to operate throughout various employment sectors
Pleasure craft	Population	Equipment assumed to be owned by households
Railyards	Population	Equipment use and Railyards activity assumed to be driven by demand
Recreational	Population	Equipment assumed to be owned by households
Transportation refrigeration units	Employment	Equipment use assumed to operate at trade-related businesses

To calculate GHG emissions for 1990, OFFROAD2007 was run for the year 1990 (see Attachment 1) and emissions appropriated to the City level using the methodology described above. GHG emissions estimates for 2020 were calculated using City growth forecasts presented in Table 4.

High Global Warming Potential GHGs

High GWP GHGs include SF_6 and replacement gasses for ODS, such as HFCs and CFCs. HFCs and CFCs are commonly emitted from refrigeration and air conditioning equipment, while SF_6 is generated by electricity transmission to the City. Although emissions of high GWP GHGs are typically small (on a mass basis) relative to other GHGs, they have high GWPs and can persist in the atmosphere for thousands of years. Given their importance, it is recommended that high GWP GHGs be included in community inventories.

Emissions of HFCs, CFCs, and SF_6 were estimated using 2005 statewide emissions data published by CARB (2010b). Based on the State's population, a per capita emissions factor was calculated for each pollutant (see Table 2). The statewide per capita factor was then multiplied by the population of

[10] The following equipment sectors were not included in the analysis: airport ground support equipment; logging equipment; military tactical support equipment; oil drilling equipment.

Stockton in 1990, 2005, and 2020 to quantify emissions of high GWP GHGs for each of the inventory years.[11] This approach is consistent with emissions inventories prepared for other local jurisdictions. Completing an analysis based on a bottom up inventory of refrigerants and other High GWP GHG sources within the City would be difficult and subject to data collection errors, and would likely not yield any more accurate results than using a statewide per capita emission factor.

Wastewater

Wastewater generated within the City is currently treated at the Regional Wastewater Control Facility (RWCF), which is owned by the Municipal Utilities Department. The treatment and breakdown of waste within the facility generates emissions of CH_4 and N_2O. These emissions are commonly referred to as "process emissions". In addition, anaerobic digestion of organic waste generates biogas, which is primarily comprised of CH_4. Fossil fuel combustion from on-site stationary equipment, such as generators, also produces GHG emissions at the RWCF. These emissions are commonly referred to as "stationary emissions".[12]

Process Emissions

Process emissions from wastewater treatment were estimated using equations 10.4 and 10.8 in CARB's LGOP (California Air Resources Board 2010a). These equations are standard equations recommended for use by local governments in preparing GHG inventories and are consistent with methodologies used for national and state level inventories.

Equations 10.4 and 10.8 estimate CH_4 and N_2O emissions from wastewater treatment based on the population served by facility, respectively. Site specific data for the daily influent flow, average nitrogen load, and biological oxygen load were not available for the RWCF. Consequently, default values suggested in the LGOP were used in these equations. Population estimates presented in Table 4 were input into the equation to calculate CH_4 and N_2O emissions in 1990, 2005, and 2020. Please refer to Attachment 1 for more information on the equations and inputs.

Stationary Emissions

Stationary emissions from the incomplete combustion of biogas were estimated using Equation 10.1 from the LGOP. Equation 10.1 estimates CH_4 emissions from biogas based on user specified activity data and default values for the molecular properties of CH_4 and biogas. Based on information provided by the City, it was assumed the RWCF generated 50,742,662 therms of biogas in 2005 (Morales pers. comm.). Emissions produced in 1990 and 2020 were estimated by multiplying the calculated baseline emissions by the population growth factors presented in Table 4. Please refer to Attachment 1 for more information on the equations and inputs.

Emissions from the combustion of gasoline, diesel, and liquefied petroleum gasoline were estimated using activity data provided by the City and the emission factors presented in Table 2. The City provided gallons of fuel consumed at the RWCF in 2005 (see Table 8). These data were multiplied by

[11] Use of replacements for ODS was less widespread in 1990 than in 2005. The per capita emission rate in 1990 for HFCs and CFCs is therefore likely lower than the 2005 emission rate. Because 1990 emissions are calculated using the 2005 per capita emission factor, this report likely overestimates emissions of HFCs and CFCs in 1990. Should the City elect to use 1990 as an emissions goal for their CAP, additional revisions can be made to the High GWP GHG sector to better characterize emissions of CFCs and HFCs in 1990.

[12] Note that emissions from electricity and/or natural gas used to power the facility are included in the Building Energy sector.

the corresponding emission factors in Table 2 to calculate emissions in 2005. Emissions generated in 1990 and 2020 were estimated by multiplying the calculated baseline emissions by the population growth factors presented in Table 4.

Table 8. Summary of Fuels Consumed at the RWCF in 2005 (gallons)

Fossil Fuel	Gallons Consumed
Gasoline	52,840.70
Diesel	12,874.86
Liquefied petroleum gasoline	96.20

Source: Morales pers. comm.

Solid Waste Management

Waste-related emissions are primarily CH_4, which is released over time when waste decomposes in a landfill. According to CalRecycle, the City deposited waste to over 30 landfills between 1995 and 2009. Only one of these landfills, French Camp, is located within the city limits. While the majority of waste emissions from these landfills do not occur within Stockton, the City is sill responsible for creating the waste that is deposited and still has control over waste generated by residents. Therefore including emissions associated with annual waste generation provides the City with an opportunity to institute reduce, reuse, recycle programs and achieve GHG reduction benefits as part of the CAP.

Waste-related emissions for 2005 were estimated using historic landfill data obtained from CalRecyle (2010) and EPA's most recent FOD model. Waste generated within the City, along with the destination landfill of that waste, was identified based on CalRecycle data for the years 1995 to 2009 (please refer to Attachment 1 for more data on the detailed waste profiles). For each landfill, the CH_4 capture efficiency[13] was determined using EPA's Landfill Methane Outreach Program (LMOP) database and a CH_4 generation study (United States Environmental Protection Agency 2009; Themelis and Ulloa 2005).[14] Yearly waste deposited in each landfill was compared to the landfill's CH_4 capture efficiency for the given year to develop a profile of CH_4emissions for each ton of waste landfilled by the City from 1995 to 2009. [15]

For estimating waste generation prior to 1995, population data from the California Department of Finance, along with the average per-capita waste generation rate from 1995 to 2009 was used (California Department of Finance 2010a, 2010b, 2010c). CalRecyle does not maintain waste profile records prior to 1995. It was therefore assumed that waste generated prior to 1995 would be deposited in the same landfills as it was in 1995.

For estimating waste generation in 2020, a linear extrapolation of population growth, combined with the average per capita waste disposal rate in 2009, was used (California Department of Finance 2010c; CalRecycle 2010). It was assumed that the City would deposit waste generated in 2020 in the same landfills accepting waste from the City in 2009. The CH_4capture efficiency for landfills in 2020

[13] For those landfills with CH_4capture systems, the higher the CH_4 capture efficiency, the less CH_4emitted.
[14] When a site-specific CH_4 capture rate was unavailable, a default efficiency of 75% was used based on the Clean Air and Climate Protection protocol.
[15] Because this approach estimates emissions from waste-decomposition at all landfills to which the City diverts waste, direct emissions at the French Camp Landfill, which is located within the City limits, were not included in the inventory to avoid double counting.

was also assumed to be equal to 2009.

Water Importation

The City currently obtains water from three sources: ground water, reservoirs, and surface water. In 2020, the Delta Water Supply Project is expected to provide approximately 25% of the City's water needs. Importing, treating, and distributing water from these sources requires electricity, which generates indirect GHG emissions.

The distribution of water resources in the City for 2005 and 2020 were provided by the City (Morales pers. comm.). Water activity data for 1990 was not available. Consequently, a linear regression analysis was performed using historic water data (1995–2005) presented in the City's 2035 General Plan Background Report (Mintier & Associates Matrix Design Group 2007). Table 9 presents the assumed water supplied for the City in 1990, 2005, and 2020.

Table 9. Water Supplies for the City of Stockton in 1990, 2005, and 2020 (acre-feet)

Source	1990 Acre-Feet	2005 Acre-Feet	2020 Acre-Feet
Surface Water	38,073	41,014	78,000
Ground Water	12,911	26,922	22,000
Delta Water Supply Project	0	0	25,000
Total	50,984	67,936	100,000

Source: Morales pers. comm.; Mintier & Associates Matrix Design Group 2007
[a] Includes the Stockton East Water District, New Melones and New Hogan Reservoirs

Indirect GHG emissions associated with the consumption of water are a result of the following activities: electricity consumption for water pumping, water importation, and water treatment. Emissions resulting from water pumping and treatment have been accounted for in the Building Energy sector as water-related energy (i.e. energy used for pumping and treatment) could not be disaggregated from the City-wide total electricity consumption provided by PG&E.

Electricity consumption required for water importation was not available. Consequently, energy intensities for embodied energy and water activity data were used to estimate emissions. The energy intensities presented in Table 4 represent the amount of energy required to transport one acre-foot of water in the San Joaquin region. These water energy proxies were multiplied by the water supply data presented in Table 9 to estimate the total energy demand for water importation. Electricity emission factors (Table 4) were then used to calculate GHG emissions.[16] Quantifying emissions based on water energy proxies and utility emission factors is consistent with recent guidance published by CAPCOA (2010).

Agriculture

Stockton does not have any livestock or animal operations within the city limits, but currently has

[16] As discussed above, improvements in renewable energy generation have reduced utility-specific emission rates between 1990 and 2005. Consequently, emissions for the 1990 backcast related to water consumption may be slightly higher than what is presented in this report. Should the City elect to use 1990 as an emissions goal for their CAP, additional revisions can be made to the water sector to better capture changes emission rates between 1990 and 2005.

approximately 3,000 acres of croplands (Stagnaro pers. comm.). Crop management generates emissions of N_2O through fertilization, which deposits anthropogenic nitrogen into soil. These emissions are generated by way of a direct (directly from the soils to which the nitrogen is added/released) and indirect (following volatilization of ammonia and nitrogen oxides from managed soils) pathways (Intergovernmental Panel on Climate Change 2006). Both direct and indirect emissions of N_2O were included in the revised inventory.

Emissions of N_2O released by fertilizers were calculated using the average quantity of nitrogen applied in synthetic fertilizer, which is 140 pounds per acre per year (Miyao pers. comm.). It was assumed that all crops in the City use the same rate of fertilizer application, and that all crops use synthetic fertilizer. This assumption is conservative considering that organic fertilizers produce much lower N_2O emissions.

The following equations were used to estimate N_2O emissions from fertilizer application on farmland (California Air Resources Board 2008a and 2008b). Direct and indirect emissions of N_2O were added together and converted to metric tons of CO_2e.

$$\textit{Direct } N_2O \textit{ Emissions} = N_f * C * (1-N_v) * N_n * M * A$$

$$\textit{Indirect } N_2O \textit{ Emissions} = N_f * C * (N_v) * N_n * M * A$$

where

N_f = nitrogen applied in fertilizer (140 lbs per acre)

C = pounds to gram conversion (453.59 grams per pound)

N_v = nitrogen volatilization (0.1)

N_n = nitrogen emitted as N_2O (0.01)

M = molecular weight ratio of N_2O to N_2 (1.57)

A = number of crop acres in Stockton (3,000 acres)

Crop acreages in 1990 and 2020 were unavailable. Consequently, emissions of N_2O from fertilizer in 1990 and 2020 were assumed to equal emissions in 2005. Future agricultural areas within the City may be condensed as a result of increasing population and urbanization. Assuming a constant crop acreage between 2005 and 2020 therefore represents the most conservative approach for estimating emissions from agriculture, given the availability of existing data and relative importance of the sector.

Analysis Limitations

Baseline Inventory

There are three primary limitations associated with the 2005 inventory:

- **Stockton Specific Activity Data**: Although considerable efforts were made to obtain activity data specific to the City, in some cases these data were unavailable and default values were substituted (e.g., wastewater treatment LGOP default equations, CH_4 capture efficiencies, quantity of nitrogen in fertilizers, etc.). These default values are intended to be representative of average activity within California, but may over- or underestimate emissions depending on the

actual level of activity in Stockton.

- **Data Aggregation**: In some emissions sectors, data was not available at a high resolution of detail. For example, electricity required to pump and treat water could not be disaggregated from building energy consumption provided by PG&E. Consequently, the building energy sector includes a small percentage of water-related electricity.
- **Scale of Off-Road Data**: Because off-road data are not readily available on a scale smaller than the County level, off-road emissions were scaled by population and employment statistics to determine emissions associated with activities in Stockton. This approach assumes that off-road equipment can be reasonably approximated with population and employment. This is not necessarily the case, because various equipment emissions may not be equally represented in the cities based on population and employment.

A greater level of detail and disaggregation would certainly strengthen this inventory. However, the revised inventory is based on acceptable methods for quantifying GHG emissions, as outlined by CARB (2010a). The results of the revised inventory are therefore accurate and will provide sufficient detail for the City to identify, quantify, and monitor effective emission reduction actions.

1990 Backcast and 2020 BAU Forecast

Where possible, 1990 and 2020 BAU projections were made using the best available information and estimates provided by City staff and experts on individual sectors. For many sectors (e.g., residential fuel combustion), projections were based on the historic and future population estimates for the City using data provided by the U.S. Census and Fehr & Peers. This method assumes that emissions are proportionate to the current population or employment, which may not be completely accurate. For example, per capita energy consumption may change over time as habits and technology change. It is also possible that the ratio of certain emissions sources (e.g., natural gas combustion in commercial buildings) to a quantity of infrastructure (e.g., commercial square feet) may change over time. However, as discussed above, the methodology utilized in this emissions analysis is consistent with the most recent state and local guidance for preparing GHG inventories. While a greater level of detail may improve the accuracy of the analysis, it would not affect the City's ability to implement and track effective measures for reducing community GHG emissions.

Updates to the Revised Inventory

The revised inventory serves as a baseline for emission reduction measures and as a starting point for future GHG emissions inventories. Updates to the GHG emissions inventory presented in this report should be conducted periodically to ensure that the inventory remains accurate and that data gaps are resolved in a timely manner. This would also enable efficient tracking of the effectiveness of any GHG reduction measures put in place to address these emission sources.

Inventory Results

This section presents the results of the revised City of Stockton baseline inventory, 1990 backcast, and 2020 BAU forecast. Table 10 and Figures 1 and 2 show emissions for each sector and their contributions to the total inventory. Figure 3 presents a breakdown of minor GHG sources, which are combined as "other sources" in Figure 1. Table 11 presents emissions by scope.

Total emissions for the City of Stockton in 2005 were 2,360,932 metric tons. Dividing these emissions by the population of Stockton in 2005, per capita emissions were estimated to be 8.5 metric tons of CO_2e per capita.[17] The largest source of emissions for the City was on-road transportation, which represented 48% of total community emissions. Transportation emissions are often the largest source of emissions in community inventories due to the sheer number of vehicles traveling throughout a jurisdiction. Building energy emissions are the second largest source of emissions and accounted for 33% of total community emissions. This sector includes emissions associated with natural gas combustion and electricity consumption in residential, commercial, and industrial buildings in Stockton. The third largest source was off road equipment, with a contribution of 8% of the total 2005 emissions. The remaining sources in order of greatest contributions were high GWP GHGs (4%), wastewater treatment (4%), solid waste management (3%) water importation (0.4%), and agriculture (0.04%).

Community wide, BAU emissions are projected to increase by approximately 13% from 2005 to 2020. The increase will occur primarily because of increases in VMT, building energy and water use, and wastewater generation. As the population and employment in Stockton grow, transportation activity and energy consumption increase. Likewise, water consumption and wastewater generation will increase due to higher demand. As shown in Table 10, transportation emissions and building energy are expected to increase by 9% and 17% between 2005 and 2020, respectively; water and wastewater emissions will grow by 42% and 11%, respectively.

Table 10. 1990 Backcast, 2005 Inventory, 2020 BAU Forecast by Sector for the City of Stockton ($MTCO_2e$)[a]

	1990		2005		2020	
Emissions Sector	$MTCO_2e$	% of Total	$MTCO_2e$	% of Total	$MTCO_2e$	% of Total
Agriculture	928	0.05%	928	0.04%	928	0.03%
Building Energy	560,993	31.3%	776,186	32.9%	911,272	34.1%
High Global Warming GHG	76,444	4.3%	100,931	4.3%	112,478	4.2%
Off-Road Equipment	154,233	8.6%	176,431	7.5%	213,300	8.0%
On-Road Transportation	836,037	46.7%	1,132,265	48.0%	1,232,663	46.1%
Solid Waste Management[b]	79,939	4.5%	65,720	2.8%	78,347	2.9%
Wastewater Treatment	75,569	4.2%	99,777	4.2%	111,191	4.2%
Water Importation	6,977	0.4%	8,694	0.4%	12,340	0.5%
Total Emissions	**1,791,120**	**100%**	**2,360,932**	**100%**	**2,672,519**	**100%**

[a] As disused in the Analysis Limitations, the calculations presented above contain a certain amount of uncertainty. Quantitative error analyses are complicated, require detailed statistical equations, and are outside the scope of the consultant's work. The EPA estimates an error range of -1% to 6% for the 2009 national inventory. Given that the City's 2005 inventory employed similar methods and analysis factors, a similar level of error can be expected, yielding an emissions range of 2,337,323 $MTCO_2e$ to 2,502,588 $MTCO_2e$. Uncertainty associated with the 1990 backcast and 2020 forecast are likely higher due to the assumptions associated with the City's socioeconomic data.

[b] Note that solid waste management emissions decline between 1990 and 2005 and then increase between 2005

[17] Note that per capita emissions vary depending on the methodologies used to estimate emissions for each source and the types of emissions included in each inventory. For example, transportation emissions in some inventories are only included within jurisdictional boundaries while in this inventory, 50% of transportation emissions that originate or terminate in Stockton are included. Thus, per capita emissions should only be compared to values calculated using the same methodology and emissions sectors.

	1990		2005		2020	
Emissions Sector	$MTCO_2e$	% of Total	$MTCO_2e$	% of Total	$MTCO_2e$	% of Total

and 2020. This is because the landfill profile between 1990 and 2020 changes. More specifically, the number and efficiency of methane capture systems is highest in 2005, which results in the dip in emissions, compared to 1990 and 2020.

Table 11. City of Stockton 2005 Community Inventory, 1990 Backcast, 2020 BAU Forecast by Scope ($MTCO_2e$)[a]

		1990 Backcast		2005 Inventory		2020 BAU Forecast	
Scope and Sector	Description of Sector	$MTCO_2e$	% of Total	$MTCO_2$	% of Total	$MTCO_2e$	% of Total
Scope 1 Emissions	Direct Emissions						
Agriculture	Fertilizer	928	0%	928	0%	927.87591	0%
Residential	Natural Gas	155,338	9%	204,279	9%	224,206	8%
Commercial	Natural Gas	147,415	8%	212,882	9%	263,025	10%
Industrial	Natural Gas	7,683	0%	11,095	0%	13,708	1%
Transportation	Fuel combustion	836,037	47%	1,132,265	48%	1,232,663	46%
Off-Road Equipment	Off-road equipment	154,233	9%	176,431	7%	213,300	8%
ODS	Refrigeration and AC	70,533	4%	93,127	4%	103,781	4%
Wastewater	Liquid waste	75,569	4%	99,777	4%	111,191	4%
Subtotal Scope 1		**1,447,735**	**81%**	**1,930,784**	**82%**	**2,162,802**	**81%**
Scope 2 Emissions	Indirect Emissions						
Residential	Electricity	107,723	6%	141,662	6%	155,481	6%
Commercial	Electricity	108,410	6%	156,555	7%	193,430	7%
Industrial	Electricity	34,425	2%	49,713	2%	61,423	2%
Waste	Waste decomposition	79,939	4%	65,720	3%	78,347	3%
Water	Electricity usage	6,977	0%	8,694	0%	12,340	0%
SF_6	Electrical transformers	5,911	0%	7,804	0%	8,697	0%
Subtotal Scope 2		**343,384**	**19%**	**430,148**	**18%**	**509,718**	**19%**
Total Scope 1 and 2		**1,791,120**	**100%**	**2,360,932**	**100%**	**2,672,519**	**100%**

[a] As disused in the Analysis Limitations, the calculations presented above contain a certain amount of uncertainty. Quantitative error analyses are complicated, require detailed statistical equations, and are outside the scope of the consultant's work. The EPA estimates an error range of -1% to 6% for the 2009 national inventory. Given that the City's 2005 inventory employed similar methods and analysis factors, a similar level of error can be expected, yielding an emissions range of 2,337,323 $MTCO_2e$ to 2,502,588 $MTCO_2e$. Uncertainty associated with the 1990 backcast and 2020 forecast are likely higher due to the assumptions associated with the City's socioeconomic data.

Figure 1. City of Stockton 2005 Community Inventory, 1990 Backcast, 2020 BAU Forecast ($MTCO_2e$)

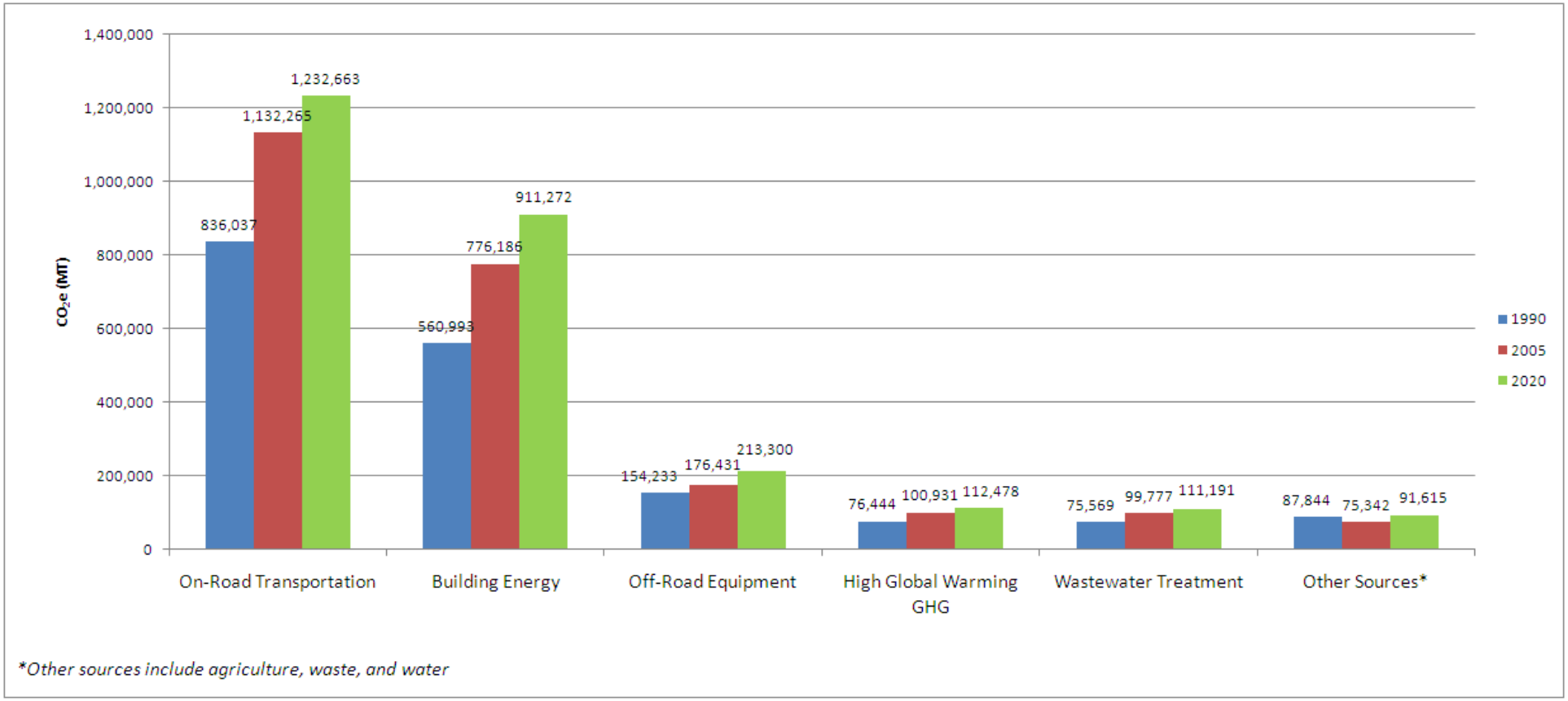


Figure 2. City of Stockton 2005 Community Inventory, 1990 Backcast, 2020 BAU Forecast ($MTCO_2e$)

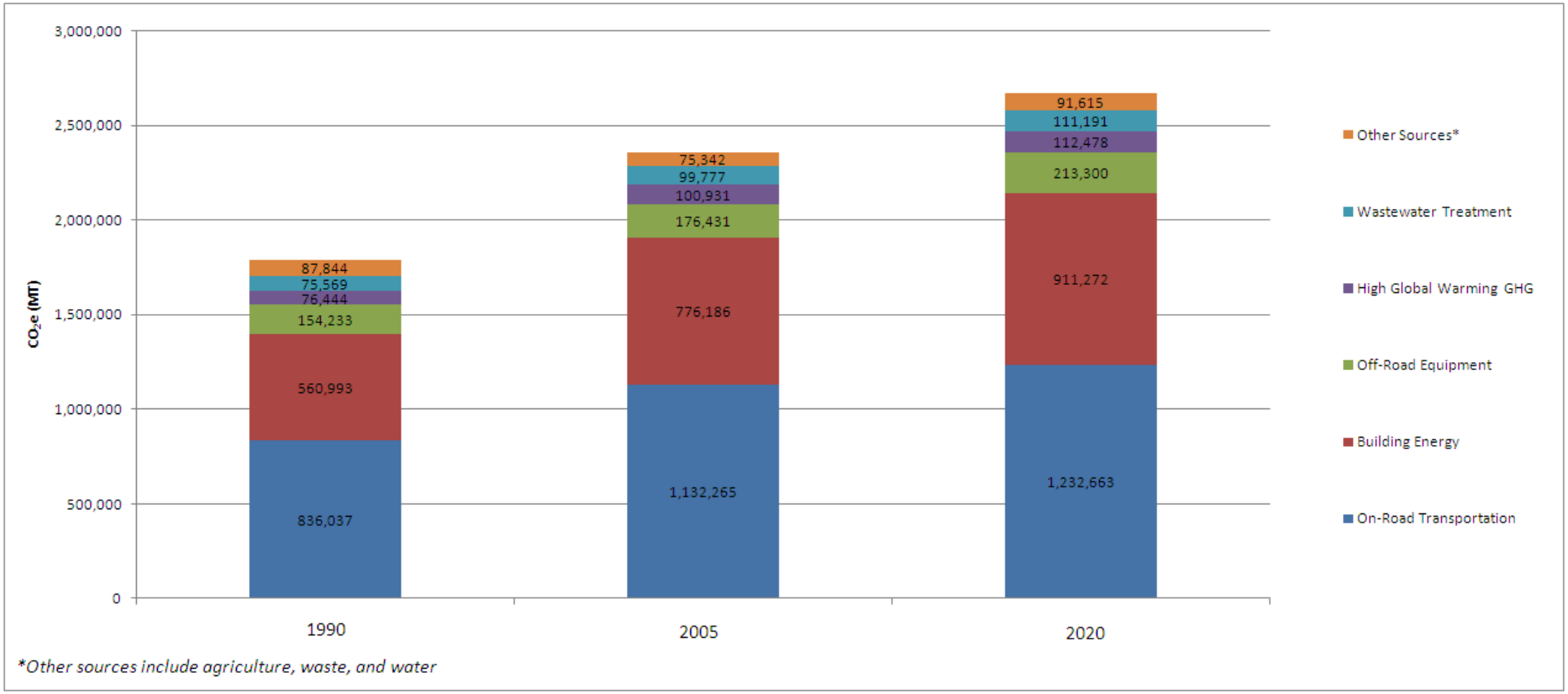
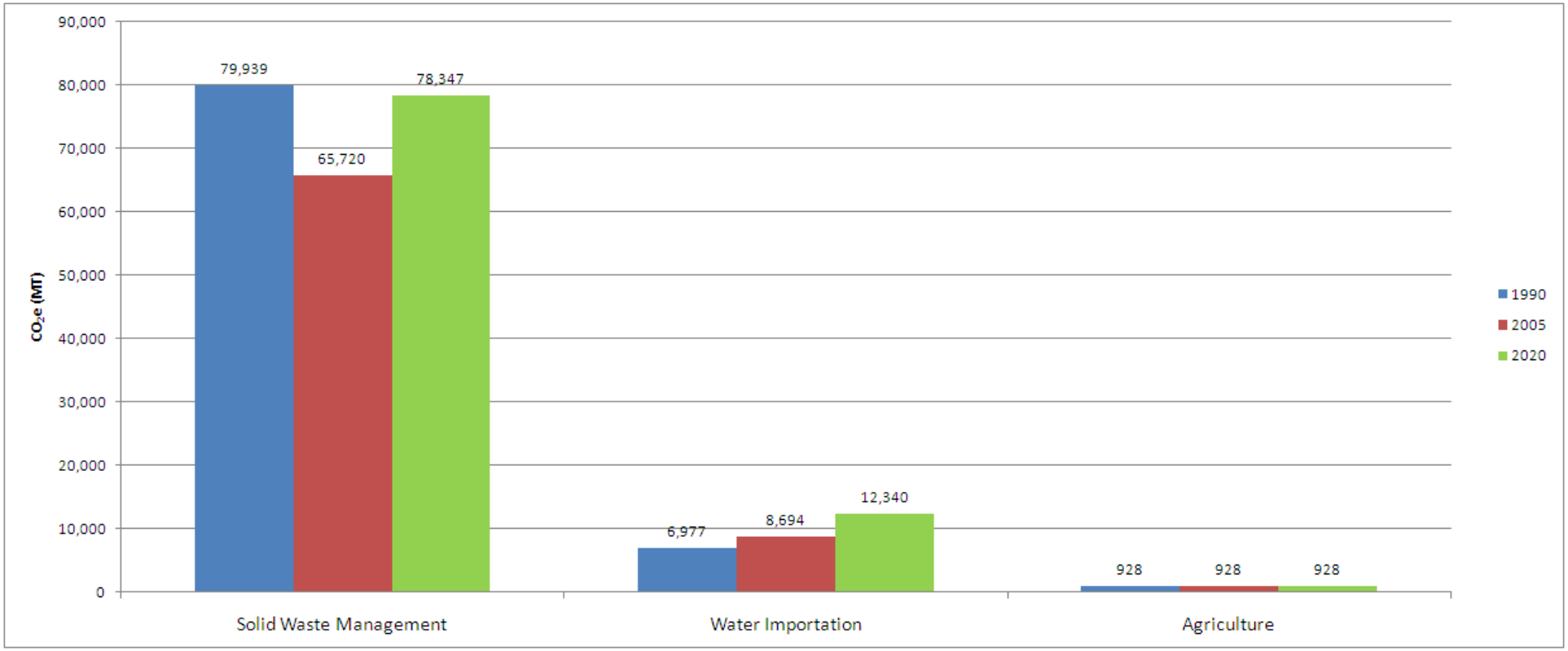


Figure 3. City of Stockton 2005 Community Inventory, 1990 Backcast, 2020 BAU Forecast – *Other Sources* ($MTCO_2e$)



References

Printed

California Air Resources Board. 2008a. *Direct N_2O Emissions from Managed Soils: 2004 N_2O from Nitrogen applied in fertilizer— Synthetic fertilizers*. Available: <http://www.arb.ca.gov/cc/inventory/doc/docs3/3C4_FertilizerNitrogen_Syntheticfertilizers_N2O_2004.htm>.

California Air Resources Board. 2008b. *Indirect N_2O Emissions from Managed Soils: 2004 N_2O from Nitrogen applied in fertilizer—Synthetic fertilizers*. Available: <http://www.arb.ca.gov/cc/inventory/doc/docs3/3C5_FertilizerNitrogen_Syntheticfertilizers_N2O_2004.htm>.

California Air Resources Board. 2010a. *Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories*. Version 1.1. May.

California Air Resources Board. 2010b. *California Greenhouse Gas Inventory for 2000–2008 by Category as Defined in the Scoping Plan*. Last Revised: May 12, 2010. Available: <http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_00-08_2010-05-12.pdf>. Accessed: January 3, 2011.

CalRecycle. 2010. *Disposal Reporting System (DRS): Single-year Countywide Origin Detail*. Available:<http://www.calrecycle.ca.gov/lgcentral/Reports/DRS/Origin/WFOrgin.aspx>. Accessed: December 15, 2010.

California Air Pollution Control Officers Association. 2010. *Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures*. August. Available: <http://www.capcoa.org/wp-content/uploads/downloads/2010/09/CAPCOA-Quantification-Report-9-14-Final.pdf>. Accessed: October 9, 2010.

California Climate Action Registry. 2009. *General Reporting Protocol. Version 3.1*. Available: <http://www.climateregistry.org/resources/docs/protocols/grp/GRP_3.1_January2009.pdf>. Accessed: August 23, 2010.

California Department of Finance. 2010a. *E-4 Historical Population Estimates for Cities, Counties and the State, 1981-1990*. Available:<http://www.dof.ca.gov/research/demographic/reports/estimates/e-4/1981-90/>. Accessed: November 11, 2010.

California Department of Finance. 2010b. *E-4 Historical Population Estimates for Cities, Counties and the State, 1991–2000, with 1990 and 2000 Census Counts*. Available:<http://www.dof.ca.gov/research/demographic/reports/estimates/e-4/1991-2000/>. Accessed: November 11, 2010.

California Department of Finance. 2010c. *E-4 Population Estimates for Cities, Counties and the State, 2001-2010, with 2000 Benchmark*. Available:

<http://www.dof.ca.gov/research/demographic/reports/estimates/e-4/2001-10/>. Accessed: November 11, 2010.

City of Stockton. 2010. *2005 Community Emissions Inventory & 2005 Municipal Operations Emissions Inventory*. Prepared by Kindelberg Morales. July.

Fehr & Peers. 2011a. Updated Stockton Climate Action Transportation Baseline VMT Estimates Inventory Report. Memorandum to Tony Held, ICF International. May 10.

Fehr & Peers. 2011b. Stockton Climate Action Plan Transportation 2020 Business as Usual VMT Estimates. Memorandum to Tony Held, ICF International. May 10.

Intergovernmental Panel on Climate Change. 1996. *Climate Change 1995: The Science of Climate Change*. Cambridge University Press. Cambridge, United Kingdom.

Intergovernmental Panel on Climate Change. 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html>. Accessed: December 29, 2008.

Intergovernmental Panel on Climate Change. 2007. *The Physical Science Basis*. Available:<http://www.ipcc.ch/ipccreports/ar4-wg1.htm>. Accessed: November 8, 2010.

Mintier & Associates Matrix Design Group. 2007. *Background Report: Stockton General Plan 2035*. Prepared for the City of Stockton. Stockton, CA. December.

Themelis, N. J. and P. A. Ulloa. 2005. *Methane generation in landfills*. Available:<http://www.seas.columbia.edu/earth/wtert/Themelis_Ulloa_Landfill.pdf>. Accessed: September 22, 2010.

U.S. Census Bureau. 1990. *Quick Tables and Demographic Profiles—Tables DP-1, DP-3, and DP-5*. Available: <http://factfinder.census.gov/servlet/AdvSearchByPlacenameServlet?_command=getResults&_keyword=Stockton&_programYear=40&_placename=16000US062805&_geoBucketId=40&_treeId=101&_state=06&_lang=en>. Accessed: December 20, 2010.

U.S. Census Bureau. 2005. *2005 American Communities Survey.* Available: <http://factfinder.census.gov/servlet/ADPGeoSearchByListServlet?ds_name=ACS_2005_EST_G00_&_lang=en&_ts=322657528706>. Accessed: May 5, 2011.

U.S. Environmental Protection Agency. 2009. *Landfill Methane Outreach Program (LMOP)*. Available: <http://www.epa.gov/lmop/>. Accessed: September 10, 2010.

U.S. Environmental Protection Agency. 2010a. *Inventory of U.S. greenhouse gas emissions and sinks: 1990–2008*. Available:<http://www.epa.gov/climatechange/emissions/usinventoryreport.html>. Accessed: November 8, 2010.

U.S. Environmental Protection Agency. 2010b. *Emissions & Generation Resource Integrated Database (eGRID)*. Version 1.1. Available: <http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html>. Accessed: June 3, 2010.

United Nations Framework Convention on Climate Change. 2006. *Updated UNFCCC reporting guidelines on annual inventories following incorporation of the provisions of decision 14/CP.11*.

Available: <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>. Accessed October 16, 2009.

Personal Communication

Miyao, Gene. Farm Advisor, Vegetable Crops, Yolo, Solano & Sacramento counties. University of California Cooperative Extension. Woodland, CA. December 19 and 22, 2008—Email message to Lindsay Christensen, ICF Jones & Stokes.

Morales, Kindelberg. Administrative Analyst II. City of Stockton, Stockton, CA. December 2010, 2010—Email message to Laura Yoon, ICF International.

Stagnaro, David. Planning Manager. City of Stockton, Stockton, CA. January 5, 2011—Phone call with Tony Held, ICF International.

Attachment B1

Additional Modeling Data

On Road Transportation

This section includes the emission factors and vehicle fleeting information used to estimate GHG emissions from the on-road transportation sector.

Table B1-1. CO_2 Emission Factors (grams/vehicle mile) for San Joaquin County[a]

Speed (mph)	1990	2005	2020
5	1,387	1,352	1,345
10	1,063	1,045	1,037
15	843	833	825
20	693	688	681
25	602	600	593
30	539	540	533
35	498	500	493
40	473	476	469
45	463	466	460
50	467	469	463
55	486	487	481
60	521	520	514
65	578	573	568
70	591	582	578
75	611	596	594

[a] The emission factors presented in this table were generated by the ARB's CT-EMFAC and EMFAC emissions models. Scenarios were run for San Joaquin County for each of the inventory years (e.g., 1990, 2005, and 2020). The models quantify emission factors based on vehicle fleet characteristics and current regulations. As such, the 2020 emissions factors do not account for future state and federal actions that will improve the fuel economy and efficiency of the transportation sector. Vehicle fleet profiles for each of the inventory years are shown in the tables below.

Sources: CT-EMFAC2007; EMFAC2007

Table B1-2. 1990 Transportation Profile by Type and Fuel for San Joaquin County

	VMT (per 1,000)		Vehicle Fuel Type			
Vehicle Type	VMT	% of Total	Gasoline	% of All Vehicles	Diesel	% of All Vehicles
Passenger Cars	5,274	52%	5,262	51%	12	0%
Light Duty Trucks	1,312	13%	1,260	12%	52	1%
Light Duty Trucks (>3751 lbs)	1,788	17%	1,783	17%	5	0%
Medium Duty Trucks	458	4%	455	4%	3	0%
Light Heavy Duty Trucks	226	2%	181	2%	45	0%
Light Heavy Duty Trucks (>10,000 lbs)	90	1%	68	1%	22	0%
Medium Heavy Duty Trucks	238	2%	191	2%	47	0%
Heavy Duty Trucks	658	6%	578	6%	80	1%
Other Buses	7	0%	3	0%	4	0%
School Buses	15	0%	12	0%	3	0%
Urban Buses	20	0%	17	0%	3	0%
Motor Homes	47	0%	45	0%	2	0%
Motorcycles	92	1%	92	1%	0	0%
Total	10,225	100%	9,947	97%	278	3%

Source: EMFAC2007

Table B1-3. 2005 Transportation Profile by Type and Fuel

	VMT(per 1,000)		Vehicle Fuel Type			
Vehicle Type	VMT	% of Total	Number	% of Total	Number	% of Total
Passenger Cars	7,793	43%	7,781	43%	12	0%
Light Duty Trucks	2,023	11%	1,971	11%	52	0%
Light Duty Trucks (>3751 lbs)	3,741	21%	3,736	21%	5	0%
Medium Duty Trucks	2,123	12%	2,120	12%	3	0%
Light Heavy Duty Trucks	434	2%	389	2%	45	0%
Light Heavy Duty Trucks (>10,000 lbs)	117	1%	95	1%	22	0%
Medium Heavy Duty Trucks	282	2%	235	1%	47	0%
Heavy Heavy Duty Trucks	1,318	7%	1,238	7%	80	0%
Other Buses	12	0%	8	0%	4	0%
School Buses	22	0%	19	0%	3	0%
Urban Buses	36	0%	33	0%	3	0%
Motor Homes	52	0%	50	0%	2	0%
Motorcycles	160	1%	160	1%	0	0%
Total	18,113	100%	17,835	98%	278	2%

Source: EMFAC2007

Table B1-4. 2020 Transportation Profile by Type and Fuel

	VMT(per 1,000)		Vehicle Fuel Type			
Vehicle Type	VMT	% of Total	Number	% of Total	Number	% of Total
Passenger Cars	10,637	45%	10,635	45%	2	0%
Light Duty Trucks	2,702	11%	2,680	11%	22	0%
Light Duty Trucks (>3751 lbs)	4,683	20%	4,682	20%	1	0%
Medium Duty Trucks	2,486	11%	2,485	11%	1	0%
Light Heavy Duty Trucks	504	2%	480	2%	24	0%
Light Heavy Duty Trucks (>10,000 lbs)	154	1%	129	1%	25	0%
Medium Heavy Duty Trucks	406	2%	338	1%	68	0%
Heavy Heavy Duty Trucks	1,612	7%	1,533	7%	79	0%
Other Buses	16	0%	11	0%	5	0%
School Buses	29	0%	24	0%	5	0%
Urban Buses	47	0%	43	0%	4	0%
Motor Homes	73	0%	71	0%	2	0%
Motorcycles	216	1%	216	1%	0	0%
Total	23,565	100%	23,327	99%	238	1%

Source: EMFAC2007

Table B1-5. CH_4 and N_2O Emission Factors (grams per mile)

Vehicle Type	CH_4	N_2O
Gasoline Passenger[a]	0.087	0.031
Gasoline Light Duty Truck[a]	0.100	0.046
Gasoline Heavy Duty[a]	0.215	0.095
Diesel Passenger[b]	0.001	0.001
Diesel Light Duty Truck[b]	0.001	0.002
Diesel Medium And Heavy-Duty Truck[c]	0.005	0.005
Motorcycles[d]	0.079	0.008

[a] Average of emissions from EPA Tier 2, Low Emissions Vehicles, EPA Tier 1a, EPA Tier 0a, Oxidation Catalyst, Uncontrolled engines.

[b] Average of emissions from advanced, moderated, and uncontrolled engines.

[c] Average of emissions from advanced, moderated, uncontrolled, and after treatment engines

[d] Average of emissions from non-catalyst control and uncontrolled engines.

Source: U.S. Environmental Protection Agency 2007.

Off-Road Equipment

Emissions from off-road equipment were estimated using CARB's OFFROAD2007 air quality model. This model provides emissions estimates for all equipment operating within a particular County. Inventories were obtained for San Joaquin County for the years 1990 (Table B1-6) and 2005 (Table B1-7). Emissions were appropriated to the City level using socioeconomic data summarized in Table 4. These data were then scaled to 2020 to obtain a BAU forecast.

Table B1-6. Daily GHG Emissions for Off-Road Equipment Operating within San Joaquin County in 1990 (metric tons/day)[a]

Equipment Category	CO_2	N_2O	CH_4
Agricultural Equipment	555.740	0.006	0.175
Construction and Mining Equipment	210.456	0.002	0.077
Dredging	2.035	0.000	0.000
Entertainment Equipment	0.764	0.000	0.000
Industrial Equipment	69.015	0.008	0.090
Lawn and Garden Equipment	16.521	0.011	0.135
Light Commercial Equipment	37.847	0.007	0.054
Other Portable Equipment	0.084	0.000	0.000
Pleasure Craft	147.788	0.036	0.365
Railyard Operations	0.010	0.000	0.000
Recreational Equipment	6.104	0.008	0.104
Transport Refrigeration Units	41.366	0.001	0.038
Total	**1,087.731**	**0.078**	**1.037**

[a] Emissions estimates are for the entire County, not the City of Stockton. City-wide estimates were obtained by scaling the County data by population and employment statistics (Table 4)

Table B1-7. Daily GHG Emissions for Off-Road Equipment Operating within San Joaquin County in 2020 (metric tons/day) [a]

Equipment Category	CO_2	N_2O	CH_4
Agricultural Equipment	519.880	0.006	0.107
Construction and Mining Equipment	298.035	0.002	0.056
Dredging	2.035	0.000	0.000
Entertainment Equipment	0.764	0.000	0.000
Industrial Equipment	71.155	0.006	0.064
Lawn and Garden Equipment	23.009	0.018	0.045
Light Commercial Equipment	38.922	0.007	0.021
Other Portable Equipment	0.084	0.000	0.000
Pleasure Craft	207.830	0.052	0.216
Railyard Operations	0.010	0.000	0.000
Recreational Equipment	7.409	0.013	0.058
Transport Refrigeration Units	52.189	0.001	0.023
Total	**1,221.323**	**0.104**	**0.591**

[a] Emissions estimates are for the entire County, not the City of Stockton. City-wide estimates were obtained by scaling the County data by population and employment statistics (Table 4)

Wastewater

Process and stationary GHG emissions associated with wastewater treatment were calculated according to the CARB's LGOP (2010a). The following equations from the LGOP Protocol were used to calculate CH_4 and N_2O emissions. Based on guidance from the ARB (2010a), CO_2 emissions were not included in the emissions analysis as they are considered biogenic. Note that because site-specific information (e.g. effluent nitrogen loads) was unavailable, default factors were utilized, as suggested by the guidance.

Equation 10.1 $E = (Digester\ Gas * FC_{H4} * p[CH_4] * [1-DE] * 0.0283 * 365.25 * 10^{-6}) * 21$

Where:

E	= CH_4 emissions, metric tons per year
Digester Gas	= Cubic feet of digester gas produced per day, 22,443,592
FC_H	= Fraction of CH4 in digester gas, LGOP default of 0.65
$p[CH_4]$	= Density of methane, LGOP default of 662.00 grams per cubic meter
DE	= CH_4 Destruction Efficiency, LGOP default of 0.99
0.0283	= Conversion factor from cubic feet to meters cubed
365.25	= Conversion factor from days to year
10^-6	= Conversion factor from grams to metric tons
21	= GWP of CH_4

Equation 10.4 $E= ((P * F_{ind-com}) * BOD5\ load\ x\ (1-FP) * Bo * MCF\ anaerobic * 365.25\ x\ 10^{-3}) x\ 21$

Where:

E	= CH_4 emissions, metric tons per year
P	= Population, see Table 4 for each inventory year
$F_{ind-com}$	= Factor for industrial and commercial co-discharge waste into the sewer system, LGOP default of 1.25
BOD5	= Amount of BOD5 produced per person per day, LGOP default value of 0.09 kilograms BOD5/person/day
FP	= Fraction of BOD5 removed in primary treatment, LGOP default of 0.325
Bo	= maximum CH_4-producing capacity for domestic wastewater, LGOP default of 0.6 kg CH_4/ kilograms BOD5 removed
MCF anaerobic	= CH4 correction factor for anaerobic systems, LGOP default of 0.8
365.25	= Conversion factor from days to year
10^-6	= Conversion factor from kilograms to metric tons
21	= GWP of CH_4

Equation 10.8 **$E = ((P * F_{ind\text{-}com}) * EF\ w/o\ nit/denit * 10^{-6})) * 310$**

Where:

E	= N_2O Emissions, metric tons per year
P	= Population, see Table 4 for each inventory year
$F_{ind\text{-}com}$	= Factor for industrial and commercial co-discharge waste into the sewer system, LGOP default of 1.25
EF w/o nit/denit	= Emission factor for a treatment plant without nitrification/denitrification, LGOP default of 3.2 grams N_2O/person/year
10^-6	= Conversion factor from grams to metric tons
310	= GWP of N_2O

Waste

Waste generated within the City was identified based on CalRecycle data for the years 1995 to 2009. Population data from the California Department of Finance, along with the average per-capita waste generation rate from 1995 to 2009 was used to estimate waste generated prior to 1995. Likewise, a linear extrapolation of population growth, combined with the average per capita waste disposal rate in 2009, was used to estimate waste generation between 2010 and 2020. Table B1-8 summarizes City waste disposal by year.

Table B1-8. City Waste Disposal by Year (tons)

Year	Waste Deposited	Year	Waste Deposited	Year	Waste Deposited	Year	Waste Deposited
1950	5,778	1968	96,018	1986	196,855	2004	362,689
1951	10,791	1969	101,031	1987	202,851	2005	351,414
1952	15,804	1970	111,754	1988	207,730	2006	347,332
1953	20,818	1971	113,011	1989	213,116	2007	328,088
1954	25,831	1972	114,536	1990	216,835	2008	295,098
1955	30,844	1973	115,857	1991	223,375	2009	255,739
1956	35,858	1974	116,568	1992	225,476	2010	257,871
1957	40,871	1975	117,686	1993	227,035	2011	259,482
1958	45,884	1976	121,243	1994	231,101	2012	261,092
1959	50,898	1977	127,951	1995	242,602	2013	262,703
1960	55,911	1978	135,065	1996	266,604	2014	264,313
1961	60,924	1979	141,366	1997	265,703	2015	265,924
1962	65,938	1980	156,407	1998	301,421	2016	267,535
1963	70,951	1981	163,521	1999	350,014	2017	269,145
1964	75,964	1982	170,635	2000	323,180	2018	270,756
1965	80,978	1983	176,123	2001	356,783	2019	272,366
1966	85,991	1984	185,575	2002	393,362	2020	273,977
1967	91,004	1985	191,571	2003	400,809		

Sources: California Department of Finance 2010a, 2010b, 2010c; CalRecycle. 2010

Based on information from Calrecyle, waste generated between 1995 and 2009 was sent to a total of 34 landfills. For each landfill, the CH_4 capture efficiency was determined using EPA's LMOP database and a CH_4 generation study. Table B1-9 identifies each landfill and its current methane capture rate.

Table B1-9. Landfills and Methane Capture Rates Considered in the Waste Analysis

Site	Capture System?	Capture Rate[a]
Altamont Landfill & Resource Recv`ry	Yes	17%
American Avenue Disposal Site	Yes	75%
Anderson Landfill, Inc.	Yes	75%
Arvin Sanitary Landfill	Yes	75%
Austin Road /Forward Landfill	Yes	75%
Azusa Land Reclamation Co. Landfill	Yes	89%
Bakersfield Metropolitan (Bena) SLF	Yes	75%
Billy Wright Disposal Site	No	0%
Corral Hollow Landfill	Yes	75%
Covanta Stanislaus, Inc.	No	0%
CWMI, KHF (MSW Landfill B-19)	No	0%
Fink Road Landfill	Yes	75%
Foothill Sanitary Landfill	No	0%
Forward Landfill, Inc.	Yes	75%
French Camp Landfill	No	0%
Guadalupe Sanitary Landfill	Yes	39%
Highway 59 Disposal Site	No	0%
Keller Canyon Landfill	Yes	75%
Kettleman Hills - B18 Nonhaz Codisposal	Yes	75%
L and D Landfill Co	No	0%
North County Landfill	No	0%
Potrero Hills Landfill	Yes	75%
Puente Hills Landfill	Yes	48%
Recology (Norcal) Ostrom Road LF Inc.	No	0%
Recology Hay Road	No	0%
Recology Pacheco Pass	Yes	75%
Sacramento County Landfill (Kiefer)	Yes	21%
Southeast Resource Recovery Facility	No	0%
Unknown Destination	No	0%
Vasco Road Sanitary Landfill	Yes	75%
West Contra Costa Landfill	Yes	75%
Yolo County Central Landfill	Yes	52%
Zanker Material Processing Facility	No	0%
Zanker Road Class III Landfill	Yes	75%

[a] If the methane capture rate was unknown, a default rate of 75% was assumed.
Sources: United States Environmental Protection Agency 2009; Themelis and Ulloa 2005

Appendix C

Greenhouse Gas Reduction Measure and Cost/ Benefit Methodology

Appendix C

GHG Reduction Measure and Cost/Benefit Methodology

C.1 Introduction

This Appendix provides a detailed overview of the calculations and assumptions used to quantify greenhouse gas (GHG) savings and costs for each of the City of Stockton's (City) GHG reduction measures. A qualitative discussion of benefits is also presented. The following information is provided for each measure.

- **Measure Description**: Details the implementation requirement(s) and reduction goal.
- **Assumptions**: Includes all assumptions used in calculating emissions reductions and costs. Because the majority of measures utilize the same assumptions, Table C-1 in Section C.5 includes a master list of assumptions for reference.
- **Analysis Details**: Presents the methods for calculating business-as-usual (BAU)[1] and baseline[2] emissions, as well as a more detailed discussion of calculations performed to quantify emissions reductions. A qualitative summary of benefits is also provided. Note that a reasonable amount of information is provided so that the reader can understand the basic methods and equations used to quantify emissions reductions and costs. However, this section *does not* include an exhaustive list of all calculations and steps performed; doing so would result in hundreds of pages of documentation. For additional information, please refer to the citations provided for each measure.

As an introduction to the measure details, this Appendix begins with an overview of the general GHG quantification methods by emissions sector, followed by a brief description of the approach for the cost analysis.

C.2 Overview of GHG Methods

The quantification of GHG reductions was based primarily on guidance provided by the California Air Pollution Control Officers Association (CAPCOA), other reference sources (such as the U.S. Environmental Protection Agency), and professional experience obtained from preparing climate action plans (CAP) for other jurisdictions in California. The majority of calculations were performed using standard factors and references, rather than performing a specific analysis of individual technologies. The following sections provide an overview of general calculation methods by emissions sector.

[1] BAU emissions are defined as those that would occur without the implementation of state (e.g., renewable energy portfolio, Title 24) or local action (e.g., Energy-1, Energy-2).

[2] Baseline emissions are defined as those that would occur with the implementation of state action, but no local action.

To avoid double counting emissions savings achieved by state programs, emissions reductions attributed to the candidate measures subtract reductions achieved through the relevant state measures first. Likewise, emissions reductions attributed to certain candidate measures subtract reductions achieved by overlapping local measures. By removing overlapping reductions, one can combine GHG reduction strategies to determine the cumulative effect of several measures without double counting measure effectiveness.

C.2.1 State Measures

The City's CAP includes emissions benefits from eleven statewide initiatives. These State measures span multiple emission sectors, but are primarily targeted at the building energy and transportation sectors. Emissions reductions achieved by these measures were apportioned to the City-level using statewide estimates of measure effectiveness and sector-specific information. For example, the California Air Resources Board (CARB) estimates that implementation of Pavley I will reduce statewide emissions from passenger vehicles by 27.7 million metric tons (MT) of CO_2 equivalent (CO_2e), or by approximately 17% (California Air Resources Board 2011). GHG reductions achieved by Pavley I within Stockton were therefore quantified by multiplying City-level 2020 BAU emissions from passenger vehicles by 17%. It is important to note that while Stockton will achieve emissions reductions as a result of State programs, implementation of State measures does not require local action.

C.2.3 Local Measures

The section summarizes local efforts that the City proposes to further reduce community-wide GHG emissions. Measures that are required by State law, such as compliance with Senate Bill X7-7, or existing City regulations, such as the Green Building Ordinance, would be mandatory for either existing and/or new development (and are identified with a [M]). The City would require implementation of these measures, pursuant to state and new or existing local laws and regulations. Measures that would be implemented through incentive-based approaches, such as building retrofits, would be voluntary and are marked with a [V]. GHG reductions associated with these voluntary measures were quantified based on anticipated participation rates. Measures that would be implemented by City but that would not create specific mandates for existing or new development are marked with a [City] mark. An example of this would be outdoor street lighting or certain transportation measures. Some measures are a combination of City measures and voluntary or mandatory measures.

Development Review Process

The City's Development Review Process (DRP) provides a streamlined and flexible program for new projects to reduce their emissions. The DRP establishes performance standards for new private developments as part of the discretionary approval process under CEQA. Under the DRP, new projects would be required to quantify project-generated GHG emissions and adopt feasible reduction measures to reduce project emissions to a level which is 29% below BAU project emissions. The DPR does not require project applicants implement a pre-determined set of measures. Rather, project applicants are encouraged to choose the most appropriate measures for achieving the 29% reduction goal, while taking into consideration cost, environmental or economic benefits, schedule, and other project requirements.

In order to quantify the reductions achieved for the DRP, the amount of new development emissions from 2012 to 2020 was estimated (174,648 MT CO_2e) and 29% reduction would result in reduction 50,648 MT CO_2e. Then the value of the other state and local measures for new development was estimated (45,685 MT CO_2e) and subtracted from the 29% reductions to derive the net additional reductions (4,963 MT CO_2e) that would result from the DRP implementation. This does not mean that the state and local other measures would apply on an equal basis for every single project, and thus individual new development projects may have higher or lower project-level burdens than the average. But the analysis conducted of this measure indicates that the bulk of reductions needed to meet the 29% reduction would be from other state and local measures would be a smaller portion from project-level reductions.

Building Energy Use

Reduction measures to address GHG emissions from building energy use are separated into two categories: energy efficiency and renewable energy. Emissions reductions associated with these measures were quantified using estimates of electricity kWh and natural gas (therms) consumed by residential, commercial, and industrial buildings (City of Stockton 2010). Activity data was provided for the existing inventory year (2005), which was scaled to 2020 under BAU conditions using the socioeconomic data summarized in City of Stockton Inventory Methodology (GHG Inventory) (Appendix B) (ICF International 2011).

Emissions reductions achieved by energy efficiency and renewable energy measures were quantified using a general standards and factors. Specifically, percent reductions in energy consumption for various actions, such as exceeding the Title 24 Standard, were obtained from CAPCOA and other literature sources. These reductions were applied to the expected 2020 energy usage to quantify total reductions in energy consumption. GHG emissions that would have been emitted had the energy been consumed were then calculated using utility-specific emission factors.

Transportation

Measures within the transportation sector seek to both reduce the number of vehicle trips, as well as encourage mode shifts from single occupancy vehicles to alternative transportation. Fehr & Peers calculated the potential reduction in vehicle miles of travel (VMT)[3] that are expected to occur by 2020 with implementation of each GHG reduction measure (Fehr & Peers 2011a) (Attachment C-1). Assumptions for existing and future land use and roadway networks were developed by City staff, as documented in the GHG Inventory (ICF International 2011).

ICF estimated GHG emissions reductions from transportation measures using VMT data provided by Fehr & Peers. Based on consultation with Fehr & Peers, all measures expect Trans-4 were assumed to affect only light-duty passenger vehicles (Trans-5 would affect heavy and medium duty vehicles). GHG emissions reductions were quantified by multiplying the percent reduction in VMT (Fehr & Peers 2011a) by the 2020 BAU transportation emissions summarized in the GHG Inventory (ICF International 2011).

[3] VMT is the number of miles traveled by vehicles on the City's roads.

Waste Generation

The City's waste reduction strategy aims to reduce the amount of waste produced by the community. Existing waste generation volumes and diversion rates were obtained from CalRecycle (n.d.). GHG emissions that would have been generated by waste if they had not been diverted were quantified using the CARB First Order Decay (FOD) model and the methodology described in the GHG Inventory (ICF International 2011).

Water Consumption

The CAP seeks to reduce energy and GHG emissions associated with water consumption through compliance with Senate Bill (SB) X7-7. Pursuant to SB X7-7, the City's urban water retailers will reduce per capita water consumption by 20% by 2020. The required per capita water usage rate in 2020 to achieve SB X7-7 was obtained from the City's Urban Wastewater Management Plan (City of Stockton 2011a). Total community-wide water usage in 2020 was calculated by multiplying the per capita rate by the forecasted 2020 population. The difference in 2020 water usage between the SB X7-7 and the BAU scenario was assumed to the represent the water reductions associated with the measure.

In addition to the compliance with SB X7-7, the City's CAP includes one measure that would improve the water efficiency of existing development. Estimates of water use by appliance type (e.g., faucets, toilets, etc.) were quantified using average water consumption rates provided by CAPCOA (2010) and the California Code of Regulations (2007 and 2010). Indirect GHG emissions from electricity required to pump, treat, distribute and/or heat the consumed water were calculated using state-specific emission factors.

Wastewater Treatment

The City completed a Capital Improvement and Energy Management Plan (EMP) to identify actions and measures to enhance operations at the Regional Wastewater Control Facility (RWCF). Based on the results of the EMP, the City developed a CAP strategy that would improve pumping and treatment energy efficiency at the RWCF by 5.7% (City of Stockton 2011b). GHG savings associated with improvements in energy efficiency were calculated using the RWCF's energy intensity factor for the treatment of waste (Parlin pers. comm.), and the anticipated volume of wastewater that would be collected and treated in 2020 (City of Stockton 2011a).

Urban Forestry

The City's CAP includes a measure to expand urban forestry programs to plant 500 new trees per year. Emissions benefits from increased shade and sequestration were quantified based on information provided by ICLEI and CAPCOA. The City's tree planting lists were consulted to determine the types of tree species appropriate for planting along City streets and in open spaces. It was assumed that tree planting would begin in 2016 and occur on an annual basis.

High Global Warming Potential GHGs

The CAP's High Global Warming Potential (GWP) GHG measure promotes Responsible Appliance Disposal (RAD). RAD programs reduce emissions of high GWP GHGs by capturing and destroying appliance foam. Emissions reductions associated with RAD were quantified using the Climate Action Reserves' U.S. Ozone Depleting Substances Project Protocol, version 1.0 (2010).

Off-Road Vehicle Activity

Measures within the off-road sector seek to increase the use of electricity and reduce the consumption of fossil fuels in heavy-duty off-road equipment. GHG emissions in 2020 for off-road activity within the City were quantified using the CARB OFFROAD2007 emissions model. OFFROAD2007 provides detailed estimates of fuel consumption, hours of operation, and emissions by equipment type and horsepower. GHG emissions associated with electrifying portions of the off-road vehicle fleet were determined by multiplying the model outputs by the anticipated emission reductions estimated by CAPCOA (2010). GHG reductions from vehicle idling restrictions were also quantified using OFFROAD2007 and standard fuel consumption factors.

C.3 Overview of Cost Analysis Methods

For GHG reduction measures in the energy, transport, waste, and water sectors, costs and savings directly associated with the implementation of each measure were estimated for the City, as well as for residents and businesses.[4] Costs estimated include initial capital costs and programmatic costs, and savings include reduced costs associated with electricity, natural gas, and fuel usage,[5] as well as the reduced need for maintenance.

Costs and savings were estimated using information specific to the City of Stockton—when available—or for similar cities in the region, State of California, or United States, prioritized in that order. The majority of data was from public sources, including the California Public Utilities Commission (CPUC), California Energy Commission (CEC), Pacific Gas & Electric (PG&E), U.S. Environmental Protection Agency (EPA), and U.S. Department of Energy (DOE), although some cost data was based on price quotes provided from suppliers serving the Northern California region. Because of the uncertainties and variability associated with costs, ranges were provided for most measures. In general, ranges reflect differences in price estimates for technologies, based on the use of multiple data sources.

Initial costs generally represent the total upfront capital investment (e.g., purchase and installation of technology) needed to produce the emission reductions estimated by the GHG Analysis in 2020, and are based on current prices.[6] These capital investments would also generate emission

[4] Indirect costs or benefits, such as environmental or health impacts, are not quantified or monetized.

[5] Annual energy savings were based on estimated reductions in 2020 and valued using average bundled PG&E retail rates by customer class. While actual rates will depend on each customer's usage and the specific rate schedules, such an analysis of utility rates was beyond the scope of this analysis.

[6] This approach shows initial costs on an undiscounted basis. To the extent that measures are actually be implemented over time (e.g., a phased-in implementation), costs would not be incurred at one time.

reductions over the lifetime of the measure.[7] For some measures, the initial capital investment is the difference between the cost of conventional and less emissions-intensive technology.

Some measures also generate cost savings through reduced energy usage, reduced need for operations and maintenance (O&M), and other means. These costs were estimated on an annual basis. O&M cost savings were estimated on an incremental basis (i.e., only the reductions in O&M costs were estimated). For example, in Energy-2, conventional light bulbs are replaced with CFLs or LEDs that have longer rated lives and lower fail rates and thus require less frequent maintenance; the average annual reductions in labor and replacement costs associated with CFL or LED fixtures is counted in this analysis as O&M cost savings.

Annual energy savings were based on reductions in 2020, as estimated through the GHG Analysis; this approach makes the assumption that 2020 energy savings are representative of the average annual savings over the measure's lifetime. To estimate the value of energy savings, average bundled PG&E retail rates by customer class were employed.[8] While the actual rate would depend on each customer's usage and the specific rate schedules, such an analysis of utility rates was beyond the scope of this analysis. For PG&E, the rates employed were provided by CPUC (2011) and PG&E (2011c). For the purposes of this analysis, 2011 projected rates were employed, and for simplicity, no change of utility rates was assumed (unless escalation was incorporated into external models employed for cost estimation, such as the National Renewable Energy Laboratory [NREL] System Advisor Model for renewable energy analysis). The value of water savings were based on the City's Municipal Utilities Department fee schedule (City of Stockton 2011c).

Simple payback periods were estimated by dividing the total initial capital cost by the annual cost savings—equal to energy cost savings plus incremental O&M cost savings, if applicable. The simple payback period represents the estimated number of years before the initial investment is repaid. Whenever possible, payback periods estimated in other analyses for similar measures and technologies were compared to those calculated by this analysis to provide a check on magnitude.

In addition, to allow for better side-by-side comparison of measures, cost-per-ton values for emissions reductions in 2020 were calculated in annualized dollars.[9] This approach adjusts for the significant variation in the lifetime of individual GHG reduction measures (e.g., from energy-efficient household appliances that last 10 years to solar panels that could last up to 30), as well as variation in capital costs and annual cost savings. In more technical terms, this cost metric represents the net present value of each measure annualized over its lifetime, and then divided by the tons of CO_2 reduction that each measure is expected to achieve in 2020. Two financial concepts are important for understanding this cost metric:

[7] In other words, these upfront investments will generate emission reductions over a longer period of time than estimated by the GHG Analysis (i.e., one year, 2020). As such, the division of GHG reductions by total initial capital costs does not result in a meaningful calculation or comparison.

[8] Customer classes included residential, small/medium commercial, and large commercial/industrial.

[9] Net costs are discounted over the lifetime of the measure at a rate of 5%, which is consistent with many other GHG emissions reduction cost analyses.

- Net present value—Net present value gives the net cost of the measure in present value terms (i.e., discounted over the lifetime of the measure). In this analysis, a negative net cost indicates that the measure is cost-saving over its lifetime.
- Discount rate—Future costs are discounted to give a comparable value in today's dollars, and the rate at which those costs are discounted is called the "discount rate." This analysis uses a discount rate of 5%, which is consistent with many other GHG emissions reduction cost analyses.

As discussed in Chapter 3, City government implementation costs were estimated by ICF and city staff for upfront program development staff costs and for annual ongoing staffing costs. These costs are presented in Table 3-3 in Chapter 3 but not discussed further in this Appendix. Where upfront capital costs or non-staff operations and maintenance costs or savings would occur for the City, they are described in this Appendix.

Costs associated with state measures were not quantified as they would occur with or without the Stockton Climate Action Plan. The summary below notes qualitatively where costs and savings may be incurred by private and public entities due to the implementation of state measures.

C.4 Overview of Measure Benefits

Many of the GHG reduction measures would result in financial, environmental, and public benefits for the City and community that are additional to the expected GHG emission reductions. These benefits include cost savings over conventional activities, reductions in criteria pollutants, job growth, economic growth, and public health improvements. Studies have shown that climate action in California can produce net gains for the statewide economy, increasing growth and creating jobs (UC Berkeley 2006a). Climate policies can produce positive economic growth through monetary savings from improvements in energy efficiency and reduced energy bills, as well as investing in technologies for innovation, which can provide new stimulus for employment (UC Berkeley 2006b). Another study demonstrated that addressing and mitigating GHG emissions on a national level can yield a large savings potential, benefit the global economy, and can be mostly achieved through implementation of existing technology (Vattenfall 2007). Based on literature reviews, a qualitative discussion of anticipated benefits is provided for each of the City's GHG reduction measures. Benefits are identified using the following icons.

Benefits for the City of Stockton's GHG Reduction Measures


Reduced Energy Use


Reduced Energy Price Volatility


Reduced Waste Generation


Economic Growth


Resource Conservation


Public Health Improvements


Energy Diversification and/or Security


Increased Quality of Life


Reduced Air Pollution


Reduced Urban Heat Island Effect


Increased Property Values


Smart Growth

C.5 Common Assumptions

As discussed in Section C.1, the measure write-ups include all assumptions used in calculating emissions reductions and costs. Because the majority of measures utilize the same assumptions, Table C-1 provides a master list of assumptions. Each assumption is numbered for reference.

Table C-1. Master List of Quantification Assumptions

Number	Parameter	Assumption	Source (if applicable)
Business-as-Usual Emissions Data (MT CO_2e)			
1	2020 Emissions from Transportation	1,232,663	ICF International 2011
2	2020 Emissions from Building Energy	911,272	ICF International 2011
3	2020 Emissions from Off-road	213,300	ICF International 2011
4	2020 Emissions from Waste	78,347	ICF International 2011
5	2020 Emissions from Water	12,340	ICF International 2011
6	2020 Emissions from Wastewater	111,191	ICF International 2011
7	2020 Emissions from High GWP GHGs	112,478	ICF International 2011
8	2020 City Wide Emissions	2,672,519	ICF International 2011
Socioeconomic Data and Growth Factors			
9	2005 Housing	95,375	Census 2005
10	2005 Existing Single Family Homes (units)	70,649	Calculated based on Census 2005 and ICF International 2011
11	2005 Existing Multi Family Homes (units)	22,408	Calculated based on Census 2005 and ICF International 2011
12	2005 Existing Other Homes (units)	2,318	Calculated based on Census 2005 and ICF International 2011
13	2012 Housing	100,770	Census 2005; Stagnaro pers. comm.
14	2012 Existing Single Family Homes (units)	74,709	Census 2005; Stagnaro pers. comm.
15	2012 Existing Multi Family Homes (units)	23,615	Census 2005; Stagnaro pers. comm.
16	2012 Existing Other Homes (units)	2,446	Census 2005; Stagnaro pers. comm.
17	2020 Housing	104,678	ICF International 2011
18	2020 Single Family Homes (units)	77,540	Calculated based on Census 2005 and ICF International 2011
19	2020 Multi Family Homes (units)	24,594	Calculated based on Census 2005 and ICF International 2011
20	2020 Other Homes (units)	2,544	Calculated based on Census 2005 and ICF International 2011
21	"New" Housing in 2020 **(2020-2012)**	3,908	2020 minus 2012 values
22	"New" Single Family Homes in 2020 (units)	2,831	2020 minus 2012 values
23	"New" Multi Family Homes (units) in 2020	979	2020 minus 2012 values
24	"New" Other Homes (units) in 2020	98	2020 minus 2012 values
25	2005 Population	278,515	Census 2005
26	2012 Population	296,994	ICF International 2011; Stagnaro pers. comm.
27	2020 Population	310,378	ICF International 2011

Table C-1. Master List of Quantification Assumptions

Number	Parameter	Assumption	Source (if applicable)
28	"New" Population in 2020 (persons) (2020-2012)	13,384	2020 minus 2012 values
29	2005 Employment	114,318	Census 2005
30	2012 Employment	123,450	ICF International 2011; Tellez pers. comm.
31	2020 Employment	141,245	ICF International 2011
32	"New" Employment in 2020 (jobs) (2020–2012)	17,795	2020 minus 2012 values
33	2005 Commercial Floor space (square feet)	24,592,000	Fehr & Peers 2011b
34	2005 Office Floor space (square feet)	6,477,000	Fehr & Peers 2011b
35	2005 Wholesale Floor space (square feet)	3,465,000	Fehr & Peers 2011b
36	2005 General Commercial Floor space (square feet)	13,245,000	Fehr & Peers 2011b
37	2005 Downtown Commercial Floor space (square feet)	1,405,000	Fehr & Peers 2011b
38	2012 Commercial Floor space (square feet)	25,589,197	ICF International 2011; Tellez pers. comm.
39	2012 Office Floor space (square feet)	6,802,000	ICF International 2011; Tellez pers. comm.
40	2012 Wholesale Floor space (square feet)	3,465,000	ICF International 2011; Tellez pers. comm.
41	2012 General Commercial Floor space (square feet)	13,914,197	ICF International 2011; Tellez pers. comm.
42	2012 Downtown Commercial Floor space (square feet)	1,408,000	ICF International 2011; Tellez pers. comm.
43	2020 Commercial Floor space (square feet)	28,348,200	Fehr & Peers 2011b
44	2020 Office Floor space (square feet)	7,386,000	Fehr & Peers 2011b
45	2020 Wholesale Floor space (square feet)	3,465,000	Fehr & Peers 2011b
46	2020 General Commercial Floor space (square feet)	15,536,200	Fehr & Peers 2011b
47	2020 Downtown Commercial Floor space (square feet)	1,961,000	Fehr & Peers 2011b
48	"New" Commercial Floor space 2020 (2020–2012)	2,759,003	2020 minus 2012 values
49	“New” Office Floor space (square feet)	584,000	2020 minus 2012 values
50	“New” Wholesale Floor space (square feet)	0	2020 minus 2012 values
51	“New” General Commercial Floor space (square feet)	1,622,003	2020 minus 2012 values
52	“New” Downtown Commercial Floor space (square feet)	553,000	2020 minus 2012 values
53	2005 Industrial Floor space (square feet)	48,265,000	Fehr & Peers 2011b
54	2012 Industrial Floor space (square feet)	55,475,000	Fehr & Peers 2011b; Tellez pers. comm.
55	2020 Industrial Floor space (square feet)	65,729,800	Fehr & Peers 2011b
56	"New" Industrial Floor space 2020 (2020–2012)	10,254,800	2020 minus 2012 values
57	Growth in housing between 2005 and 2020	1.10	ICF International 2011

Table C-1. Master List of Quantification Assumptions

Number	Parameter	Assumption	Source (if applicable)
58	Growth in employment between 2005 and 2020	1.24	ICF International 2011
59	Growth in population between 2005 and 2020	1.11	ICF International 2011
60	Roof space: Floor space (commercial development)	0.30	Stagnaro pers. comm.
61	Percent 2005 Stockton Employment of County (%)	42%	Census 2005
62	Percent 2005 Stockton Population of County (%)	43%	Census 2005
Global Warming Potentials			
63	Carbon Dioxide	1	IPCC 1996
64	Methane	21	IPCC 1996
65	Nitrous Oxide	310	IPCC 1996
66	CFC-11	4,750	California Climate Action Registry 2009
67	HCFC-141b	725	California Climate Action Registry 2009
Emission Factors			
68	2005 PG&E Electricity Emissions Factor (lbs CO_2/MWh)	489	City of Stockton 2010
69	2020 PG&E Electricity Emissions Factor (lbs CO_2/MWh)	372	Calculated based on California Energy Commission 2007
70	2007 Statewide Electricity Emissions Factor (lbs CO_2/MWh)	681	ICF International 2011
71	2007 Statewide Electricity Emissions Factor (lbs CH_4/MWh)	0.02829	Environmental Protection Agency 2010a
72	2007 Statewide Electricity Emissions Factor (lbs N_2O/MWh)	0.00623	Environmental Protection Agency 2010a
73	2020 Statewide Electricity Emissions Factor (lbs CO_2/MWh)	507	Calculated based on California Energy Commission 2007
74	2020 Statewide Electricity Emissions Factor (lbs CH_4/MWh)	0.0210603	Calculated based on California Energy Commission 2007
75	2020 Statewide Electricity Emissions Factor (lbs N_2O/MWh)	0.0046379	Calculated based on California Energy Commission 2007
76	2005 and 2020 Natural Gas Emissions Factor (kg CO_2/MMBtu)	53.06	Climate Registry 2011
77	2005 and 2020 Natural Gas Emissions Factor (g CH_4/M^3)	0.037	Climate Registry 2011
78	2005 and 2020 Natural Gas Emissions Factor (g N_2O/M^3)	0.035	Climate Registry 2011
79	Ratio—Single: Multi Family Housing—Electricity	1.39	Energy Information Administration 2009

Table C-1. Master List of Quantification Assumptions

Number	Parameter	Assumption	Source (if applicable)
80	Ratio—Single: Multi Family Housing—Natural Gas	1.23	Energy Information Administration 2009
81	Groundwater Importation Energy Proxy (kWh/MG)	896	California Air Pollution Control Officers Association 2010
82	Surface water Importation Energy Proxy (kWh/MG)	1,510	California Air Pollution Control Officers Association 2010
83	State Water Project Importation Energy Proxy (kWh/MG)	896	California Air Pollution Control Officers Association 2010
84	Water Treatment Energy Proxy (kWh/MG)	111	California Air Pollution Control Officers Association 2010
85	Water Distribution Energy Proxy (kWh/MG)	1,272	California Air Pollution Control Officers Association 2010
86	Wastewater Distribution Energy Proxy (kWh/MG)	2,550	Parlin pers. comm.
87	Gasoline (MT CO_2/GJ)	0.0658	GHGID Model Tool
88	Gasoline (MT CH_4/GJ)	0.0000	GHGID Model Tool
89	Gasoline (MT N_2O/GJ)	0.0000	GHGID Model Tool
90	Diesel (MT CO_2/GJ)	0.0704	GHGID Model Tool
91	Diesel (MT CH_4/GJ)	0.0000	GHGID Model Tool
92	Diesel (MT N_2O/GJ)	0.0000	GHGID Model Tool
93	LGP (MT CO_2/GJ)	0.0599	GHGID Model Tool
94	LGP (MT CH_4/GJ)	0.0000	GHGID Model Tool
95	LGP (MT N_2O/GJ)	0.0000	GHGID Model Tool
96	Kg CO_2/gallon diesel	10.15	Climate Registry 2011
Detailed Building Energy Data			
97	CEC Forecast Climate Zone	2	California Air Pollution Control Officers Association 2010
98	2005 Residential Electricity Usage (kWh)	633,260,860	City of Stockton 2010
99	2005 Commercial Electricity Usage (kWh)	699,836,120	City of Stockton 2010
100	2005 Industrial Electricity Usage (kWh)	222,230,294	City of Stockton 2010
101	2012 Residential Electricity Usage (kWh)	669,085,031	City of Stockton 2010; Stagnaro pers. comm.
102	2012 Commercial Electricity Usage (kWh)	743,598,323	City of Stockton 2010; Stagnaro pers. comm.
103	2012 Industrial Electricity Usage (kWh)	239,983,323	City of Stockton 2010; Stagnaro pers. comm.
104	2020 Residential Electricity Usage (kWh)	695,032,957	Projected City of Stockton 2010
105	2020 Commercial Electricity Usage (kWh)	864,677,756	Projected City of Stockton 2010
106	2020 Industrial Electricity Usage (kWh)	274,575,128	Projected City of Stockton 2010
107	"New" Residential Energy Usage (kWh) (2020–2012)	25,947,926	2020 minus 2012 values
108	"New" Commercial Energy Usage (kWh) (2020–2012)	121,079,434	2020 minus 2012 values
109	"New" Industrial Energy Usage (kWh) **(2020–2012)**	34,591,805	2020 minus 2012 values
110	2005 Residential Natural Gas Usage (therms)	38,401,223	City of Stockton 2010
111	2005 Commercial Natural Gas Usage (therms)	40,018,337	City of Stockton 2010

Table C-1. Master List of Quantification Assumptions

Number	Parameter	Assumption	Source (if applicable)
112	2005 Industrial Natural Gas Usage (therms)	2,098,110	City of Stockton 2010
113	2012 Residential Natural Gas Usage (therms)	40,573,617	City of Stockton 2010; Stagnaro pers. comm.
114	2012 Commercial Natural Gas Usage (therms)	42,520,767	City of Stockton 2010; Stagnaro pers. comm.
115	2012 Industrial Natural Gas Usage (therms)	2,265,719	City of Stockton 2010; Stagnaro pers. comm.
116	2020 Residential Natural Gas Usage (therms)	42,147,111	Projected City of Stockton 2010
117	2020 Commercial Natural Gas Usage (therms)	49,444,384	Projected City of Stockton 2010
118	2020 Industrial Natural Gas Usage (therms)	2,592,306	Projected City of Stockton 2010
119	"New" Residential Natural Gas Usage (therms) (2020–2012)	1,573,494	2020 minus 2012 values
120	"New" Commercial Natural Gas Usage (therms) (2020–2012)	6,923,617	2020 minus 2012 values
121	"New" Industrial Natural Gas Usage (therms) (2020–2012)	326,586	2020 minus 2012 values
Detailed Transportation Data			
122	Percent Emissions Light-Duty	55%	California Air Resources Board 2006
123	Percent Emissions heavy and medium-duty	44%	California Air Resources Board 2006
124	Percent emissions heavy-duty	31%	California Air Resources Board 2006
125	2020 BAU Annual VMT	2,302,429,855	ICF International 2011
126	Annual VMT Reduction from Trans-1 (GDSA/3,000 unit goal in Settlement Agreement) Annual VMT Reduction from Trans-1 (GDSA/300 units low-range assumption for analysis only)	2,789,0380 5,593,990	Fehr & Peers, 2011c Fehr & Peers 2011a
127	Annual VMT Reduction from Trans-2	6,048,050	Fehr & Peers 2011a
128	Annual VMT Reduction from Trans-3	4,939,180	Fehr & Peers 2011a
129	Annual VMT Reduction from Trans-4	3,741,615	Fehr & Peers 2011a
130	Annual VMT Reduction from Trans-5	5,664,800	Fehr & Peers 2011a
131	Annual VMT Reduction from Trans-6	0	Fehr & Peers 2011a
132	Annual VMT Reduction from Trans-7	7,713,180	Fehr & Peers 2011a
133	Annual VMT Reduction from Trans-8	19,953,820	Fehr & Peers 2011a
Detailed Water Data			
134	2005 Water Consumption from the State Water Project (gallons)	0	Morales pers. comm.
135	2005 Water Consumption from Surface Water (gallons)	13,364,470,509	Morales pers. comm.

Table C-1. Master List of Quantification Assumptions

Number	Parameter	Assumption	Source (if applicable)
136	2005 Water Consumption from Ground Water (gallons)	8,772,572,172	Morales pers. comm.
137	2012 Water Consumption from the State Water Project (gallons)	4,724,364,979	Morales pers. comm.; Stagnaro Pers. Comm.
138	2012 Water Consumption from Surface Water (gallons)	15,629,520,054	Morales pers. comm.; Stagnaro Pers. Comm.
139	2012 Water Consumption from Ground Water (gallons)	7,842,439,195	Morales pers. comm.; Stagnaro Pers. Comm.
140	2020 Water Consumption from the State Water Project (gallons)	8,146,285,725	Morales pers. comm.
141	2020 Water Consumption from Surface Water (gallons)	17,270,125,737	Morales pers. comm.
142	2020 Water Consumption from Ground Water (gallons)	7,168,731,438	Morales pers. comm.
143	1992 California Standard for Residential Lavatory Faucets (gallons/minute)	2.5	1992 Energy Policy Act
144	2010 California Standard for Residential Lavatory Faucets (gallons/minute)	2.2	California Air Pollution Control Officers Association 2010
145	Mandatory CALGreen Standard for Residential Lavatory Faucets (gallons/minute)	1.65	California Air Pollution Control Officers Association 2010
146	1992 California Standard for Commercial Lavatory Faucets (gallons/minute)	2.5	1992 Energy Policy Act
147	2010 California Standard for Commercial Lavatory Faucets (gallons/minute)	0.5	California Air Pollution Control Officers Association 2010
148	Mandatory California Standard Commercial Lavatory Faucet(gallons/minute)	0.4	California Air Pollution Control Officers Association 2010
149	Voluntary California Standard Commercial Lavatory Faucet(gallons/minute)	0.35	California Air Pollution Control Officers Association 2010
150	1992 California Standard for Residential Kitchen Faucets (gallons/minute)	2.5	1992 Energy Policy Act
151	2010 California Standard for Residential Kitchen Faucets (gallons/minute)	2.2	California Air Pollution Control Officers Association 2010
152	Mandatory CALGreen Standard for Residential Lavatory Faucets (gallons/minute)	1.8	California Air Pollution Control Officers Association 2010
153	1992 California Standard for Commercial Kitchen Faucets (gallons/minute)	2.5	1992 Energy Policy Act

Table C-1. Master List of Quantification Assumptions

Number	Parameter	Assumption	Source (if applicable)
154	2010 California Standard for Commercial Kitchen Faucets (gallons/minute)	2.2	California Air Pollution Control Officers Association 2010
155	Mandatory CALGreen Standard for Commercial Lavatory Faucets (gallons/minute)	1.8	California Air Pollution Control Officers Association 2010
156	Voluntary CALGreen Standard for Commercial Lavatory Faucets (gallons/minute)	1.6	California Air Pollution Control Officers Association 2010
157	Average Per Capita Kitchen Faucet Duration (minutes/day)	4	2010 Green Building Code *(24 CCR 11)*
158	Average Per Capita Kitchen Faucet Use	1	2010 Green Building Code *(24 CCR 11)*
159	Average Per Capita Lavatory Faucet Duration (minutes/day)	0.25	2010 Green Building Code *(24 CCR 11)*
160	Average Per Capita Lavatory Faucet Use	3	2010 Green Building Code *(24 CCR 11)*
161	Number of Employees per Faucet	40	2010 Green Building Code *(24 CCR 11)*
162	Percent Hot Water Use for Faucets and Showers (%)	70%	ICELI 2010
163	Percent Hot Water Use for Dishwashers (%)	100%	Based on professional experience
164	Percent of Homes with Electric Water Heaters	11%	Energy Information Administration 2009
165	Electricity Use to Heat Gallon of Hot Water (kWh)	0.19	ICLEI 2010
166	Natural Gas Use to Heat Gallon of Hot Water (therms)	0.0098	ICLEI 2010
167	1992 California Standard for Showerheads (gallons/minute)	2.5	1992 Energy Policy Act
168	2010 California Standard for Showerheads (gallons/minute)	2.5	California Air Pollution Control Officers Association 2010
169	Mandatory California Standard for Showerheads (gallons/minute)	2	California Air Pollution Control Officers Association 2010
170	Average Shower Time (min/day/person)	8	2010 Green Building Code *(24 CCR 11)*
171	1992 California Standard for Residential Toilets (gallons/flush)	1.6	1992 Energy Policy Act
172	2010 California Standard for Residential Toilets (gallons/flush)	1.6	California Air Pollution Control Officers Association 2010
173	Mandatory CALGreen Standard for Residential Toilets (gallons/flush)	1.28	California Air Pollution Control Officers Association 2010
174	1992 California Standard for Commercial Toilets (gallons/flush)	1.6	1992 Energy Policy Act
175	2010 Current California Standard Commercial Toilet (gallons/flush)	1.6	California Air Pollution Control Officers Association 2010

Table C-1. Master List of Quantification Assumptions

Number	Parameter	Assumption	Source (if applicable)
176	Mandatory 2010 CALGreen Commercial Toilet (gallons/flush)	1.28	California Air Pollution Control Officers Association 2010
177	Voluntary 2010 CALGreen Commercial Toilet (gallons/flush)	1.12	California Air Pollution Control Officers Association 2010
178	Flushes per commercial toilet per day (men)	1	2010 Green Building Code *(24 CCR 11)*
179	Flushes per commercial toilet per day (women)	3	2010 Green Building Code *(24 CCR 11)*
180	1992 GPF for Baseline Urinals	1.6	1992 Energy Policy Act
181	2010 GPF for Baseline Urinals	1	California Air Pollution Control Officers Association 2010
182	GPF for low-flow urinals (CALGreen Mandatory)	0.5	California Air Pollution Control Officers Association 2010
183	GPF for low-flow urinals (CALGreen Voluntary)	0.5	California Air Pollution Control Officers Association 2010
184	Flushes per Commercial Urinals per Day (men)	2	2010 Green Building Code *(24 CCR 11)*
185	Average Dishwasher Size in 1992 (Standard Dishwashers) (gallons/cycle/cubic foot)	15	ConSol 2010
186	2010 California Standard for Standard Dishwashers (gallons/cycle/cubic foot)	6.5	California Air Pollution Control Officers Association 2010
187	Voluntary CALGreen Standard for Standard Dishwashers (gallons/cycle/cubic foot)	5.8	California Air Pollution Control Officers Association 2010
188	ENERGY STAR Standard Dishwasher (gallons/cycle/cubic foot)	5	California Air Pollution Control Officers Association 2010
189	ENERGY STAR Compact Dishwasher (gallons/cycle/cubic foot)	3.5	California Air Pollution Control Officers Association 2010
190	2010 California Standard for Compact Dishwashers (gallons/cycle/cubic foot)	4.5	California Air Pollution Control Officers Association 2010
191	Voluntary CALGreen Standard for Compact Dishwashers (gallons/cycle/cubic foot)	3.5	California Air Pollution Control Officers Association 2010
192	Ratio of Compact to Standard Dishwashers (unit less)	50%	-
193	Average Dishwasher (runs per unit per week)	5	Dethman & Associates 1999
194	Average Dishwasher (runs per person per day)	0.1	Aquacraft, Inc. 1999
Detailed Off-road Data			
195	Percent Emission Reductions for a fully electric vehicle in PG&E's service area by vehicle type		
196	Diesel	72.90%	California Air Pollution Control Officers Association 2010
197	CNG	77.10%	California Air Pollution Control Officers Association 2010
198	Gasoline		
199	2-strokes	64.10%	California Air Pollution Control Officers Association 2010

Table C-1. Master List of Quantification Assumptions

Number	Parameter	Assumption	Source (if applicable)
200	4-strokes		
201	<25 HP	64.10%	California Air Pollution Control Officers Association 2010
202	25-50 HP	80.30%	California Air Pollution Control Officers Association 2010
203	50-120 HP	80.10%	California Air Pollution Control Officers Association 2010
204	120-175 HP	79.50%	California Air Pollution Control Officers Association 2010
205	175-500 HP	78.90%	California Air Pollution Control Officers Association 2010
206	Fuel Consumption for Heavy Duty Equipment for 1 Hour at Idle—High Idle (gallons)	1.2	Environmental Protection Agency 2009a
207	Fuel Consumption for Heavy Duty Equipment for 1 Hour at Idle—Low Idle (gallons)	0.6	Environmental Protection Agency 2009a
208	Emissions from One Hour of Operation for One Mid-Sized Tractor (kg CO_2)	64.11	URBEMIS: modeled tractor for one hour
209	Equipment Operating time (hours/day)	8	Based on professional experience
210	Percent idling time for average CA heavy-heavy-duty diesel truck	29.40%	Environmental Protection Agency 2009a
211	BAU heavy duty vehicle idling time (min)	5	Based on CARB regulation for heavy duty trucks
Detailed High GWP GHG and Appliance Data			
212	Refrigerators per Multi Family Home	1.05	California Energy Commission 2010
213	Refrigerators per Single Family Home	1.33	California Energy Commission 2010
214	Freezers per Multi Family Home	0.1	California Energy Commission 2010
215	Freezers per Single Family Home	0.23	California Energy Commission 2010
216	Clothes Washers per Multi Family Home	0.36	California Energy Commission 2010
217	Clothes Washers per Single Family Home	0.96	California Energy Commission 2010
218	Dishwashers per Multi Family Home	0.58	California Energy Commission 2010
219	Dishwashers per Single Family Home	0.74	California Energy Commission 2010
220	Ceiling Fans per Multi Family Home	0.36	California Energy Commission 2010
221	Ceiling Fans per Single Family Home	0.77	California Energy Commission 2010
222	Percent of Installed BA Remaining at EOL	95%	Climate Action Reserve 2010
223	BAU Lifetime Emission Rate (CFC-11)	44%	Climate Action Reserve 2010
224	BAU Lifetime Emission Rate (HCFC-141b)	50%	Climate Action Reserve 2010
225	Foam Recovery Efficiency	90%	Climate Action Reserve 2010
226	Transport and Destruction Emissions Factor (tCO_2e per ton ODS)	8	Climate Action Reserve 2010
Additional Detailed Cost Data			
227	Bathroom Faucets per Single Family Home	2.45	U.S. Census Bureau 2011a; assumes one faucet per

Table C-1. Master List of Quantification Assumptions

Number	Parameter	Assumption	Source (if applicable)
			bathroom
228	Bathroom Faucets per Multi Family Home	1.47	U.S. Census Bureau 2011b; assumes one faucet per bathroom
229	Kitchen Faucets per Single Family Home	1	U.S. Census Bureau 2011a; assumes one faucet per kitchen
230	Kitchen Faucets per Multi Family Home	1	U.S. Census Bureau 2011b; assumes one faucet per kitchen
231	Showerheads per Single Family Home	2.22	U.S. Census Bureau 2011a; assumes one showerhead per bathroom
232	Showerheads per Multi Family Home	1.44	U.S. Census Bureau 2011b; assumes one shower head per bathroom
233	Toilets per Single Family Home	2.45	U.S. Census Bureau 2011a; assumes one toilet per bathroom
234	Toilets per Multi Family Home	1.47	U.S. Census Bureau 2011b; assumes one toilet per bathroom

State-1: Senate Bills 1078/107/2 (Renewables Portfolio Standard)

Measure Description

Obligates investor-owned utilities (IOUs), energy service providers (ESPs), and Community Choice Aggregations (CCAs) to procure 20% of retail sales from eligible renewable sources by 2013, 25% by 2016. Senate Bill 2 (2011) also sets forth a longer range target of procuring 33% of retail sales by 2020.

Assumptions

Quantification of this measure employs assumptions 68–75, 98–100, and 104–106 in Table C-1.

Analysis Details

GHG Analysis

Implementation of the Renewables Portfolio Standard (RPS) will increase the proportion of renewable energy within PG&E's energy supply mix. Renewable resources, such as wind and solar power, produce the same amount of energy as coal and other traditional sources, but do not emit any GHGs. By generating a greater amount of energy through renewable resources, electricity provided to the City by PG&E will be cleaner and less GHG intensive.

Baseline Emissions

The GHG Inventory (Appendix B) estimates that community-wide electricity consumption[10] in 2020 would generate approximately 929 million MT CO_2e.

Emissions Reductions

Achievement of the RPS will reduce the carbon intensity of PG&E's 2020 CO_2 emission factor from 489 pounds per MWh to 372 pounds per MWh (City of Stockton 2010; California Energy Commission 2007). Similar reductions will be achieved by the statewide CH_4 and N_2O emission factors (Table C-1). GHG emissions that would be generated by community-wide electricity consumption in 2020 will therefore be lower as a result of the RPS-adjusted emission factors.

GHG emissions generated from electricity consumption were calculating assuming implementation of the RPS by multiplying 2020 community-wide electricity consumption by the RPS-adjusted emissions factors. The difference in emissions between the 2020 BAU and 2020 RPS scenarios represents the emissions reductions achieved by this measure.

Cost Analysis

The City would not incur any direct costs to implement this measure. Indirect costs may be incurred by private and public entities depending on changing electricity retail prices.

Co-Benefit Analysis

The RPS provides California with a flexible, market-based strategy to increase renewable energy generation and distribution. As discussed above, renewable energy provides the same amount of power as tradition sources (e.g., coal), but does not emit any GHGs or other criteria pollutants. Renewable energy therefore represents a clean source of power for the State and the City of Stockton. The following benefits are expected from implementation of the RPS (IEA 2007; U.S. EPA 2009b).



Reduced Air Pollution: PG&E generates power through a combination of sources, but the majority of electricity is provided by fossil fuels (e.g., coal, natural gas). The extraction and processing of fossil fuels generates localized pollutants emissions at the place of mining and at the source of power generation. These pollutants may be dispersed into the atmosphere, where they can be transported over long distances and result in regional air pollution. Reducing the amount of fossil fuels processed at power stations

[10] Includes electricity consumed by buildings and water conveyance.

through increased generation of renewable energy would contribute to cumulative reductions in criteria pollutants throughout the State.


Waste Reduction: The generation of electricity from fossil fuels (e.g., coal, natural gas) generates a substantial amount of waste including, but not limited to: fly ash, bottom ash, flue gas, and sludge. These products can have detrimental effects on the environment if absorbed into groundwater, soil, and/or biota. The extraction and mining of fossil fuels also generates waste. Increasing renewable energy production would reduce waste created by fossil fuel supplied power.


Energy Diversity and Security: Fuels that are traded in the open market are subject to energy supply constraints and interruptions from political unrest, conflict, and trade embargoes. Centralized power structures (e.g., stations, substations, refineries, ports) may also be targets of energy terrorism. Providing a diversified and domestic energy supply reduces foreign fuel dependency.


Reduced Price Volatility: Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, energy prices would likely be subject to fluctuations and frequent price spikes. Renewables would contribute to the diversification of the energy supply mix, thereby buffering local economies from the volatile global energy market.


Economic Development: Development of renewable energy infrastructure (e.g., solar farms, wind turbines) would create new jobs, taxes, and revenue for local and regional economies.


Public Health Improvements: Reduced regional air pollution and waste generation would contribute to overall improvements in public health.

State-2: Title 24 Standards for Non-Residential and Residential Buildings

Measure Description

Requires that building shells and building components be designed to conserve energy and water. Mandatory and voluntary measures become effective on January 1, 2011, and the guidelines will be periodically updated.

Assumptions

Quantification of this measure employs assumptions 69, 74–75, 76–78, 104–106, and 116-118 in Table C-1. The following assumptions were also considered.

- Stringency of the residential 2013 Title 24 Standard (effective 2014) increased by 25%, relative to the 2008 Standard. Stringency of the residential standards is assumed to increase by 17% every three years after 2014 (Maziar pers. comm.)
- Stringency of the nonresidential 2013 Title 24 Standard (effective 2014) increased by 30%, relative to the 2008 Standard. Stringency of the nonresidential standards is assumed to increase by 7% every three years after 2014 (Maziar pers. comm.).

Analysis Details

GHG Analysis

Energy efficiency upgrades as a result of the Title 24 standards will reduce electricity and natural gas consumption, thereby resulting in GHG emissions savings.

Baseline Emissions

Baseline emissions were not utilized in the analysis of this measure.

Emissions Reductions

Stringency of 2008 residential and nonresidential standards increased by 17% and 7%, respectively, relative to the 2005 standards, which were in place at the time of the GHG inventory baseline year (2005). Revisions to the Title 24 standards in 2013, which will take effect in 2014, will increase the stringency of the residential and nonresidential standards by 25% and 30%, respectively, relative to the 2008 standards. It is assumed that Title 24 will be revised again in 2017 and 2020 to include a 17% and 7% stringency increase in the residential and nonresidential standards, respectively, relative to the 2014 update

Based on the assumed stringency increases in the residential and nonresidential Title 24 standards, respectively, 2020 residential energy use would be reduced to 57% of the 2005 baseline code. Nonresidential energy use would likewise be reduced to 44% of the 2005 baseline code. However, because the Title 24 code is revised on a tri-annual basis, only a fraction of total energy use is subject to each code revision. To avoid-double counting, estimated energy reductions were multiplied by the annual fraction of electricity subject to each code revision. The average reduction in residential energy use in 2020 as a result of the Title 24 Standards was therefore estimated to be 73.3% (26.7% of the 2005 baseline code), and the average non-residential reductions were estimated to be 79.9% (20.1% of the 2005 baseline code).

Energy reductions achieved by Title 24 were calculated by multiplying 26.7% and 20.1% by the City's 2020 BAU electricity and natural gas consumption for residential and non-residential development, respectively. GHG emissions reductions were quantified by multiplying the total energy reductions by the appropriate utility emission factors.[11]

Cost Analysis

The City would not incur any direct costs for implementation of this measure. Upgrades of existing private or public buildings would need to comply with new Title 24 standards, as applicable, resulting in costs and energy savings. New development would need to comply with updates to Title 24 over time which would increase upfront housing costs while resulting in energy savings over the life of the home.

[11] Utility emission factors account for decreased carbon intensities as a result of the State's RPS.

Co-Benefit Analysis

The following benefits are expected from implementation of the Title 24 standards.

 **Reduced Energy Use:** Energy retrofits and standards would improve the efficiency of residential and non-residential buildings. As such, the amount of energy (e.g., electricity, natural gas) consumed per unit of activity would be lowered.

 **Reduced Air Pollution:** Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity) and local air pollution (from reduced burning of natural gas).

 **Resource Conservation:** Increased building efficiency would reduce water consumption, which would help conserve freshwater.

 **Increased Property Values**: Energy-efficient bulidings have higher properity values and resale prices than less efficient buildings.

 **Public Health Improvements**: Reduced regional and local air pollution would contribute to overall improvements in public health. A well-built, energy-efficient structure is also more durable and directly reduces certain health aliments. For example, properly sealed ducts help prevent mold and dust mites that can cause asthma.

 **Increased Quality of Life**: The reduction of health aliments (see above) contributes to increased quality of life. Additionally, energy-efficient structures improve general comfort by equalizing room temperatures and reducing indoor humidity.

State-3: AB 1109 (Huffman) Lighting Efficiency and Toxics Reduction Act

Measure Description

Structured to reduce statewide electricity consumption in the following ways: 1) At least 50% reduction from 2007 levels for indoor residential lighting, and 2) At least 25% reduction from 2007 levels for indoor commercial and outdoor lighting, by 2018.

Assumptions

Quantification of this measure employs assumptions 69, 74–75, and 104–106 in Table C-1. The following assumptions were also considered.

- Approximately 5.20% of electricity is used for commercial outdoor lighting (CEC 2006).
- Approximately 28.90% of electricity is used for commercial indoor lighting (CEC 2006).
- Approximately 20.00% of electricity is used for residential indoor lighting (CEC 2006; NEED 2011).

Analysis Details

GHG Analysis

Lighting requires the production of electricity to power the lights, which represents an indirect source of GHG emissions. Different light fixtures have different efficacies; in other words, certain bulbs can utilize less energy to obtain the same output. Replacing less efficient bulbs with energy-efficient ones therefore reduces energy consumption, and thus GHG emissions.

Baseline Emissions

Electricity usage from outdoor lighting in commercial developments within the City was estimated by multiplying the total anticipated energy use in 2020 under BAU conditions by 5.2% (CEC 2006). Electricity usage from indoor lighting in residential and commercial developments within the City was estimated by multiplying the total anticipated energy use in 2020 under BAU conditions by 20.00% and 28.90%, respectively (CEC 2006; NEED 2011).

Emissions Reductions

AB 1109 will reduce indoor residential lighting by at least 50%. Energy reductions within the residential sector were calculated by multiplying the baseline indoor energy consumption for residential lighting by 0.50. AB1109 will reduce both outdoor and indoor commercial lighting by at least 25%. Energy reductions within the commercial sector were calculated by multiplying the baseline energy consumption for commercial lighting by 0.25. GHG emissions reductions were then quantified by multiplying the total energy reductions by the appropriate utility emission factors.

Cost Analysis

Lighting upgrades will incur upfront costs while resulting in energy savings over time after installation.

Co-Benefit Analysis

The following benefits are expected from implementation of AB1109.



Reduced Energy Use: Energy-efficient lighting (e.g., compact fluorescent lamps [CFL]) consumes, on average, 75% less electricity than incandescent bulbs.



Reduced Air Pollution: Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity).



Increased Property Values: Energy-efficient bulidings have higher properity values and resale prices than less efficient buildings.



Increased Quality of Life: CFLs have a much longer lifetime than incandescent bulbs, resulting in reduced bulb turn-over and the need to purchase new fixtures.

State-4: AB 32 Solar Water Heaters

Measure Description

Creates a $25 million per year, 10-year incentive program to encourage the installation of solar water heating systems that offset natural gas use in homes and businesses throughout the state.

Assumptions

Quantification of this measure employs assumptions 18–19 and 73–75 in Table C-1. The following assumptions were also considered.

- Solar water heaters reduce natural gas use by 130 therms (CARB 2008).
- An average of 0.013 water heaters per home will be replaced as a result of AB 1470 (CARB 2008; California Department of Finance 2000).

Analysis Details

GHG Analysis

California relies heavily on natural gas for water heating. Rooftop solar water heating technologies are designed to reduce fuel consumption, and thus GHG emissions. It is estimated that by creating a mainstream market, California can save more than 1 billion therms of natural gas per year—24% of the state's residential natural gas usage. (Huffman et. al. 2007)

Baseline Emissions

Baseline emissions were not utilized in the analysis of this measure.

Emissions Reductions

CARB estimates that implementation of AB 1470 would result in the installation of 200,000 solar water heaters by 2020. Assuming that an average of 0.013 heaters per home would be replaced as a result of AB 1470, and that Stockton would have 102,134 single- and multifamily homes in 2020 (Census 2005; ICF International 2011), a total of 1,277 water heaters would be replaced with solar systems. Each solar water heater will reduce natural gas use by 130 therms (CARB 2008). Natural gas reductions were therefore calculated by multiplying 130 therms by 1,277. GHG emissions reductions were then quantified by multiplying the total energy reductions by the appropriate utility emission factors.

Cost Analysis

Solar water heater installations will require upfront costs that will be offset over time by energy savings.

Co-Benefit Analysis

The following benefits are expected from implementation of AB 1470.

 **Reduced Energy Use:** Solar water heaters consume, on average, 130 therms less natural gas than non-solar units.

 **Reduced Air Pollution:** Reduced energy use would contribute to corresponding reductions in local air pollution (from reduced burning of natural gas).

 **Increased Property Values**: Energy-efficient bulidings have higher properity values and resale prices than less efficient buildings.

State-5: AB 1493 (Pavley I)

Measure Description

Pavley I will reduce GHG emissions from automobiles and light duty trucks by 30% from 2002 levels by the year 2016. The regulations affect 2009 models and newer.

Assumptions

Quantification of this measure employs assumptions 1 and 122 in Table C-1. The following assumption were also considered: Pavley I will reduce statewide emissions from passenger vehicles by 17% (California Air Resources Board 2011).

Analysis Details

GHG Analysis

Engine efficiency improvements will reduce fuel consumption, thereby reducing GHG emissions from fossil fuel combustion.

Baseline Emissions

Because Pavley I only applies to light-duty vehicles, baseline emissions from light-duty autos were quantified by multiplying BAU emissions from the transportation sector by 0.55.[12]

Emissions Reductions

CARB Pavley I will reduce statewide passenger vehicle emissions by 17% (California Air Resources Board 2011) so GHG reductions within Stockton were estimated by multiplying BAU emissions by 0.17.

Cost Analysis

The City would not incur costs to implement this measure. Private/public parties may incur additional vehicle costs depending on new vehicle prices but costs will be offset through fuel savings.

Co-Benefit Analysis

The following benefits are expected from implementation of Pavley I.

 **Reduced Energy Use:** Pavley I would increase the fuel efficiency of passenger vehicles, which would reduce the amount of fossil fuels consumed per mile travelled.

 **Reduced Air Pollution:** Efficient vehicles burn less fuel per mile travelled then less efficient vehicles. Air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide[13], and ozone precursors[14], would therefore be reduced.

 **Public Health Improvements**: Fossil fuel combustion releases several toxic air containments known to cause adverse human health effects. Improvements in vehicle efficiency would reduce the amount of fuel combusted, resulting in corresponding reductions in toxic air containments.

 **Energy Security**: In 2009, 51% of petroleum consumed by the U.S. was imported from oversees (EIA 2010). Reducing fuel consumption by passenger vehicles would lessen the demand for petroleum and ultimately the demand for imported oil.

[12] Value based on an EMFAC2007 model run for San Joaquin County in 2020. Light-duty auto assumed to represent "light-duty auto (PC)", "light-duty trucks (T1)" and "light-duty trucks (T2)".

[13] Sulfur dioxide contributes to acid rain.

[14] Ozone precursors (reactive organic compounds and nitrogen oxides) contribute to smog formation.

State-6: Advanced Clean Cars

Measure Description

Introduces new standards for model years 2017–2025, and will increase fuel economy up to 43 miles per gallon by 2020.

Assumptions

Quantification of this measure employs assumptions 1 and 122 in Table C-1. The following assumptions were also considered.

- Advanced Clean Cars will reduce statewide emissions from passenger vehicles by 3.8 million MT CO_2e (California Air Resources Board 2011).

Analysis Details

GHG Analysis

Engine efficiency improvements will reduce fuel consumption, thereby reducing GHG emissions from fossil fuel combustion.

Baseline Emissions

The GHG Inventory quantified emissions associated with on-road transportation in 2020 under BAU conditions (Appendix A). Because the Advanced Clean Cars initiative only applies to light-duty vehicles, baseline emissions from light-duty autos were quantified by multiplying BAU emissions from the transportation sector by 0.55.[15]

Emissions Reductions

CARB estimates that implementation of the Advanced Clean Cars initiative will reduce statewide emissions from passenger vehicles by 3.8 million MT CO_2e[16], or by approximately 2.5% (California Air Resources Board 2011). GHG reductions achieved by the Advanced Clean Cars initiative within Stockton were therefore quantified by multiplying baseline emissions from passenger vehicles by 0.025.

Cost Analysis

The City would not incur any costs to implement this measure. Private and public parties may incur additional costs for new vehicles depending on the effect on new vehicle prices but costs will be offset through fuel savings over life of vehicle.

Co-Benefit Analysis

The following benefits are expected from implementation of the Clean Cars Initiative.

 **Reduced Energy Use:** The Clean Cars Initiative would increase the fuel efficiency of passenger vehicles, which would reduce the amount of fossil fuels consumed per mile travelled.

 **Reduced Air Pollution:** Efficient vehicles burn less fuel per mile travelled then less efficient vehicles. Air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide[15], and ozone precursors[16], would therefore be reduced.

 **Public Health Improvements**: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Improvements in vehicle efficiency would reduce the amount of fuel

[15] Value based on an EMFAC2007 model run for San Joaquin County in 2020. Light-duty auto assumed to represent "light-duty auto (PC)," "light-duty trucks (T1)" and "light-duty trucks (T2)".

[16] Reductions calculated based on the existing Pavley II standard, which applies to model years 2017 to 2020 and will improve fuel economy to 43 miles per gallon.

combusted, resulting in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.

 **Energy Security**: In 2009, 51% of petroleum consumed by the U.S. was imported from oversees (EIA 2010). Reducing fuel consumption by passenger vehicles would lessen the demand for petroleum and ultimately the demand for imported oil.

State-7: Executive Order S-1-07 (Low Carbon Fuel Standard)

Measure Description

Requires a 10% reduction in the carbon intensity of California's transportation fuels by 2020.

Assumptions

Quantification of this measure employs assumptions 1 and 3 in Table C-1. The following assumptions were also considered.

- Low Carbon Fuel Standard (LCFS) will reduce statewide emissions from transportation-based fuels[17] by 15 million MT CO_2e (California Air Resources Board 2011).

Analysis Details

GHG Analysis

The LCFS is a policy-based strategy that targets carbon emissions generated through the lifecycle of transportation fuels (i.e., from extraction to production to consumption). The standard assigns a maximum level of GHG emissions per unit of fuel produced for several refiners and importers. Companies that exceed the LCFS through development of biofuels and other clean technologies are able to sell their excess credits, creating a flexible and dynamic market for low-carbon transportation fuels. (Sperling and Yeh 2009)

The U.S. Fresno Federal District court ruled in December 2011 that the LCFS violates the Commerce Clause of the U.S. Constitution. CARB appealed this ruling in early January, 2012 and in September 2013 the U.S. 9th Circuit Court of Appeals overturned the District court ruling, finding that the LCFS did not violate the Commerce Clause. While further appeal may occur, it is assumed for the time being that the LCFS will be ultimately implemented by 2020 as proposed. If the LCFS were ultimately to be blocked from implementation due to federal legal constraints, then the goal for reduction for the CAP would be adjusted downward accordingly.

Baseline Emissions

The GHG Inventory quantified emissions associated with on-road and off-road transportation in 2020 under BAU conditions (Appendix A). Reductions achieved by overlapping state and local measures (e.g., Pavley I, Trans-1) were subtracted to obtain baseline emissions for the transportation and off-road sectors.

Emissions Reductions

CARB estimates that implementation of the LCFS will reduce statewide emissions from transportation-based fuels[17] by 15 million MT CO_2e, or by approximately 8.9% (California Air Resources Board 2011). GHG reductions achieved by the LCFS within Stockton were therefore quantified by multiplying baseline transportation and off-road emissions by 0.089.

Cost Analysis

The City would not incur any costs to implement this measure. Private and public parties may incur additional costs for transportation fuels depending on the effect on fuel prices.

Co-Benefit Analysis

The following benefits are expected from implementation of LCFS.



Reduced Air Pollution: The LCFS would reduce the carbon content of transportation fuels by 10%. The combustion of hydrocarbons generates numbers air pollutants, including particulate matter, carbon monoxide, sulfur dioxide[15], and ozone precursors[16]. Reducing the carbon content of transportation fuels would therefore reduce local and regional air pollution.

[17] Excludes aviation fuel, residual fuel oil, and lubricants.

 **Public Health Improvements**: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Improvements in vehicle efficiency would reduce the amount of fuel combusted, resulting in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.

 **Energy Security**: In 2009, 51% of petroleum consumed by the U.S. was imported from oversees (EIA 2010). Reducing the carbon-content of transportation fuels would reduce the consumption and demand for imported petroleum.

 **Reduced Price Volatility:** Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, fuel prices would likely be subject to fluctuations and frequent price spikes. Biofuels and other renewable technologies would contribute to the diversification of the energy supply mix, thereby buffering local economies from the volatile global energy market.

 **Economic Development**: The development of biofuels and other clean technologies would create new jobs, taxes, and revenue for local and regional economies.

State-8: AB 32 Transportation Reduction Strategies

Measure Description

The AB 32 Scoping Plan includes vehicle efficiency measures (in addition to Pavley and LCFS) that focus on maintenance practices. The Tire Pressure Program will increase vehicle efficiency by assuring properly inflated automobile tires to reduce rolling resistance. The Low Friction Oils Program will increase vehicle efficiency by mandating the use of engine oils that meet certain low friction specifications. The Heavy-Duty Vehicle GHG Emission Reduction Program will increase heavy-duty vehicle (long-haul trucks) efficiency by requiring installation of best available technology and/or CARB approved technology to reduce aerodynamic drag and rolling resistance.

Assumptions

Quantification of this measure employs assumptions 1, 122, and 123 in Table C-1. The following assumptions were also considered.

- Tire Pressure Program will reduce statewide emissions from passenger vehicles by 0.6 million MT CO_2e (California Air Resources Board 2011).
- Low Friction Oils Program will reduce statewide emissions from passenger vehicles by 2.8 million MT CO_2e (California Air Resources Board 2011).
- Heavy-Duty Vehicle GHG Emission Reduction Program will reduce statewide emissions from heavy-duty vehicles by 0.9 million MT CO_2e (California Air Resources Board 2011).

Analysis Details

GHG Analysis

Improvements in engine efficiency and vehicle technology will reduce fuel consumption, thereby reducing GHG emissions from fossil fuel combustion.

Baseline Emissions

The GHG Inventory quantified emissions associated with on-road transportation in 2020 under BAU conditions (Appendix A). The Tire Pressure and Low Friction Oils programs primarily affect light-duty vehicles, whereas the Heavy-Duty GHG Emissions Reduction Program affects heavy-duty vehicles. Baseline emissions from light-duty autos and heavy-duty vehicles were quantified by multiplying BAU emissions from the transportation sector by 0.55 and 0.31, respectively.[18]

Emissions Reductions

Tire Pressure

CARB estimates that implementation of the Tire Pressure Program will reduce statewide emissions from passenger vehicles by 0.6 million MT CO_2e, or by approximately 0.39% (California Air Resources Board 2011). GHG reductions achieved by the Tire Pressure Program within Stockton were therefore quantified by multiplying baseline emissions from passenger vehicles by 0.0039.

Low Friction Oils

CARB estimates that implementation of the Low Friction Oils Program will reduce statewide emissions from passenger vehicles by 2.8 million MT CO_2e, or by approximately 1.8% (California Air Resources Board 2011). GHG reductions achieved by the Low Friction Oils Program within Stockton were therefore quantified by multiplying baseline emissions from passenger vehicles by 0.018.

Heavy-Duty Vehicle GHG Emissions Reductions

CARB estimates that implementation of the Heavy-Duty Vehicle GHG Emission Reduction Program will reduce statewide emissions from heavy-duty vehicles by 0.9 million MT CO_2e, or by approximately 2.2% (California Air Resources Board 2011). GHG reductions achieved by the Heavy-Duty Vehicle GHG Emission

[18] Value based on an EMFAC2007 model run for San Joaquin County in 2020. Light-duty auto assumed to represent "light-duty auto (PC)", "light-duty trucks (T1)" and "light-duty trucks (T2)".

Reduction Program within Stockton were therefore quantified by multiplying baseline emissions from heavy-duty vehicles by 0.022.

Cost Analysis

The City would not incur any costs to implement this measure. Private and public parties may incur additional costs for new vehicles depending on the effect on new vehicle prices but costs will be offset through fuel savings over life of vehicle.

Co-Benefit Analysis

The following benefits are expected from implementation of AB 32 Transportation Reduction Strategies.

 **Reduced Energy Use:** The AB32 Transportation Reduction Strategies would increase the efficiency of passenger vehicles and heavy-duty trucks, which would reduce the amount of fossil fuels consumed per mile travelled.

 **Reduced Air Pollution:** Efficient vehicles burn less fuel per mile travelled then less efficient vehicles. Air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide[15], and ozone precursors[16], would therefore be reduced.

 **Public Health Improvements**: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Improvements in vehicle efficiency would reduce the amount of fuel combusted, resulting in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.

 **Energy Security**: In 2009, 51% of petroleum consumed by the U.S. was imported from oversees (EIA 2010). Reducing fuel consumption by passenger vehicles would lessen the demand for petroleum and ultimately the demand for imported oil.

State-9: AB 32 High Global Warming Potential GHG Reduction Strategies

Measure Description

The AB 32 Scoping Plan includes a series of measures that target refrigerants and other High GWP GHGs from vehicles and stationary sources. The Motor Vehicle/Air Conditioning Measure reduces GHG emissions from the non-professional servicing of motor vehicle air conditioning systems. The Consumer Products Measure reduces the use of high GWP compounds in consumer products when alternatives are available. The Stationary Source Measure targets the refrigerant value chain for stationary equipment.

Assumptions

Quantification of this measure employs assumption 7 in Table C-1 and the following:

- Motor Vehicle/Air Conditioning Measure will reduce statewide emissions of high GWP GHGs by 0.2 million MT CO_2e (California Air Resources Board 2011).
- Consumer Products Measure will reduce statewide emissions of high GWP GHGs by 0.2 million MT CO_2e (California Air Resources Board 2011).
- Stationary Source Measure will reduce statewide emissions of high GWP GHGs by 5.9 million MT CO_2e (California Air Resources Board 2011).

Analysis Details

GHG Analysis

Although emissions of high GWP GHGs are typically small relative to other GHGs, they are extremely potent and can persist in the atmosphere for thousands of years. Targeting sources of high GWP GHGs, such as air conditioning and refrigeration units, will therefore result in substantial GHG reduction benefits.

Baseline Emissions

Baseline emissions were not utilized in the analysis of this measure.

Emissions Reductions

Motor Vehicle/Air Conditioning

CARB estimates that implementation of the Motor Vehicle/Air Conditioning Measure will reduce statewide emissions of high GWP GHGs by 0.2 million MT CO_2e, or by approximately 0.50% (California Air Resources Board 2011). GHG reductions achieved by the Motor Vehicle/Air Conditioning Measure within Stockton were therefore quantified by multiplying BAU emissions from high GWP GHGs by 0.005.

Consumer Products

CARB estimates that implementation of the Consumer Products Measure will reduce statewide emissions of high GWP GHGs by 0.2 million MT CO_2e, or by approximately 0.50% (California Air Resources Board 2011). GHG reductions achieved by the Consumer Products within Stockton were therefore quantified by multiplying BAU emissions from high GWP GHGs by 0.005.

Stationary Source

CARB estimates that implementation of the Stationary Source Measure will reduce statewide emissions of high GWP GHGs by 5.9 million MT CO_2e, or by approximately 15.6% (California Air Resources Board 2011). GHG reductions achieved by the Stationary Source within Stockton were therefore quantified by multiplying BAU emissions from high GWP GHGs by 0.156.

Cost Analysis

The City would not incur any costs to implement this measure. Costs to private and public parties may be incurred depending if the measure affects costs of refrigerants, vehicle servicing, or consumer products.

Co-Benefit Analysis

No benefits have been identified at this time.

State-10: AB 32 Landfill Methane Program

Measure Description

CARB's Landfill Methane Rule requires gas collection and control systems on landfills with greater than 450,000 tons of waste-in-place. The measure also establishes statewide performance standards to maximize methane capture efficiencies.

Assumptions

The following assumptions were considered in the evaluation of this measure.

- Eight landfills (see below) would install a methane system with a capture efficiency of 75%.

Analysis Details

GHG Analysis

Methane capture systems can reduce the amount of methane released from the decomposition of waste. CARB estimates that approximately 53 landfills will be affected by the Landfill Methane Rule, resulting in a statewide reduction of 0.8 million MT CO_2e in 2020 (California Air Resources Board 2008).

Baseline Emissions

Baseline emissions were not utilized in the analysis of this measure.

Emissions Reductions

According to CalRecycle, the City deposited waste to over 30 landfills between 1995 and 2009. A review of the waste-in-place at these landfills indicates that the following eight landfills would be subject to CARB's Landfill Methane Rule:

- Billy Wright Disposal Site.
- Foothill Sanitary Landfill.
- French Camp Landfill.
- Highway 59 Disposal Site.
- L and D Landfill Company.
- North County Landfill.
- Recology (Norcal) Ostrom Road LF Inc.
- Recology Hay Road.

None of these landfills currently have methane capture systems. Pursuant to the Landfill Methane Rule, it was assumed that by 2020, all eight landfills would install a methane system with a capture efficiency of 75%.[19] GHG emissions generated by City waste in 2020 were re-calculated using these assumptions and the methods outlined in the GHG Inventory (Appendix B).

Cost Analysis

The City would not incur any direct costs to implement this measure. Costs of compliance at landfills may be passed down to waste generators.

[19] Based on the Clean Air and Climate Protection protocol for default methane capture efficiency assumptions.

Co-Benefit Analysis

The following benefits are expected from implementation of the Landfill Methane Rule.

 **Reduced Air Pollution:** Capture systems prevent methane from migrating into the atmosphere and contributing to local smog.

 **Resource Conservation:** Anaerobic digesters help prevent groundwater contamination by reducing the leaching of organic pollutants. The integrity of freshwater systems would therefore be conserved.

 **Increased Quality of Life**: Methane capture helps reduce odors and other hazards associated with landfill gas emissions.

DRP-1: Development Review Process [M]

Measure Description

New discretionary development would be required to reduce their emissions by 29% compared to unmitigated conditions consistent with current City CEQA practice ad SJAPCD recommended CEQA thresholds.

Assumptions

Quantification of this In order to quantify the reductions achieved for the DRP, the amount of new development operational emissions from 2012 to 2020 was estimated (174,648 MT CO2e) and 29% reduction would result in reductions of 50,648 MT CO_2e. Then the value of the other state and local measures for new development was estimated (45,685 MT CO_2e) and subtracted from the 29% reductions to derive the net additional reductions (4,963 MT CO_2e) that would result from the DRP implementation. This does not mean that the state and local other measures would apply on an equal basis for every single project, and thus individual new development projects may have higher or lower project-level burdens than the average. But the analysis conducted of this measure indicates that on average, the bulk (~25%) of reductions needed to meet the 29% reduction would be from other state and local measures with a smaller portion from project-level reductions.

Analysis Details

GHG Analysis

See above.

Cost Analysis

No cost analysis was completed for the DRP as individual project proponents would choose different strategies to achieve their project-level reductions to meet the performance standard overall. Costs would depend on the measures that they select. In general, one can expect project proponents to select the most cost-effective approaches as they affect the project developer's upfront costs. This may not always coincide with the most cost-effective measures from a building owner's perspective as measures with net savings but longer payback periods may not be favored by a proponent although they result in less long-term cost overall.

It is important to note that, under current CEQA guidelines, the greenhouse gas emissions of new discretionary development must be analyzed, and where found significant, must be mitigated if there is feasible mitigation available. At present, the City uses the San Joaquin Valley Air Pollution Control District's (SJVAPCD) recommended threshold of a 29% reduction from BAU for evaluating projects. Whether or not Stockton decides to adopt a CAP, CEQA review of new discretionary development will still require reduction of GHG emissions to a less than significant level if there is feasible mitigation available and if there are not overriding circumstances. As a result, additional costs or savings associated with the DRP are no additional costs or savings with the CAP, as they will occur with or without CAP adoption.

Co-Benefit Analysis

Co benefits will depend on the exact measures selected by individual project proponents, but would be the same as the corresponding strategies described below, i.e., if a project proponent were to select energy-efficiency measures as part of meeting their project reductions, the benefits would be similar in character to those described below for energy efficiency retrofits.

Energy-1: Green Building Ordinance [M]

Measure Description

The City's existing Green Building Ordinance requires that all building additions greater than 500 square feet for single-family detached residential homes and all non-residential building additions greater than 5,000 square feet for nonresidential space must meet or exceed 2008 Title 24 Standards for the total building space. It should be noted that this is an existing Ordinance and will be required with or without adoption of the CAP.

The City is considering potential changes to the existing Green Building Ordinance currently (October 2013) and any potential revisions will require approval by the City and the CED. Accordingly, GHG reductions achieved by the City's Green Building Ordinance have not been quantified as part of this document. Potential emissions reductions (beyond Title 24 requirements), as well as costs and operational savings, associated with the revised Green Building Ordinance will be assessed following approval by the CEC.

Assumptions

TBD

Analysis Details

GHG and Cost Analysis - TBD

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-1.

 **Reduced Energy Use:** Energy retrofits and standards would improve the efficiency of residential and non-residential buildings. As such, the amount of energy (e.g., electricity, natural gas) consumed per unit of activity would be lowered.

 **Reduced Air Pollution:** Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity) and local air pollution (from reduced burning of natural gas).

 **Resource Conservation:** Increased building efficiency would reduce water consumption, which would help conserve freshwater.

 **Increased Property Values**: Energy-efficient bulidings have higher properity values and resale prices than less efficient buildings.

 **Public Health Improvements**: Reduced regional and local air pollution would contribute to overall improvements in public health. A well-built, energy-efficient structure is also more durable and directly reduces certain health aliments. For example, properly sealed ducts and air leaks helps prevent mold and dust mites that can cause asthma.

 **Increased Quality of Life**: The reduction of health aliments (see above) contributes to increased quality of life. Additionally, energy-efficient structures improve general comfort by equalizing room temperatures and reducing indoor humidity.

Energy-2: Outdoor Lighting Upgrades for Existing Development [CITY, V]

Measure Description

This measure has two parts. Measure Energy-2a would require the City to implement program to change out traffic signals, and street lights. with the following goals:

- **Street Lighting**: Installation of energy-efficient bulbs (e.g., light emitting diode [LED], high pressure sodium [HPS]) in 50% of streetlights.
- **Traffic Signals**: Installation of energy-efficient bulbs (LED) in all traffic signals.

Measure Energy-2b would encourage the replacement of less efficient outdoor bulbs with energy efficient ones for existing residential and commercial development through voluntary incentive-based approaches with the following goal:

- **Existing Residential and Commercial Development**: Installation of energy-efficient bulbs (e.g., compact fluorescent [CFL]) in 75% of outdoor lighting fixtures.

Assumptions

Quantification of this measure employs assumptions 2, 13-24, 58-59, 63-65, 69, 73-75, 101-102, 107-108, 114-115, and 120-121 in Table C-1. The following assumptions were also considered.

- Approximately 5.20% of electricity is used for commercial outdoor lighting (CEC 2006).
- Approximately 4.70% of electricity was assumed to be used for residential outdoor lighting (CEC 2006).
- Penetration rate of 25% for existing residential and commercial development.
- Installation of an outdoor CFL fixture achieves a 75% reduction in energy usage, relative to an incandescent bulb (EPA 2011).
- A total of 21,288 streetlights would operate in the City in 2020 (Stagnaro pers. comm.).
- Streetlights are assumed to operate 11 hours per day, 365 days per year (ICLEI 2010).
- The BAU streetlight profile for incandescent bulbs would be (ICLEI 2010):
  - 20% Mercury Vapor (182 watts)
  - 6% Metal Halide (200 watts)
  - 64% High Pressure Sodium Cutoff (192 watts)
  - 10% Low Pressure Sodium Cutoff (180 watts)
- A total of 210 traffic lights would operate in the City in 2020 (Stagnaro pers. comm.); 10% of which were already assumed to have LED bulbs
- Traffic lights operate for 24 hours per day.
- The wattage of an incandescent traffic light is 150 (U.S. Department of Energy 2004).
- Replacement of an incandescent traffic light with an LED fixture achieves a 90% reduction in energy use (CAPCOA 2010).

In addition to using the assumptions made to quantify the GHG reductions, the cost analysis also employs numerous additional assumptions, described in the Analysis Details below.

Analysis Details

GHG Analysis

Lighting requires the production of electricity to power the lights, which represents an indirect source of GHG emissions. Different light fixtures have different efficacies; in other words, certain bulbs can utilize less energy to obtain the same output. Replacing less efficient bulbs with energy-efficient ones therefore reduces energy consumption, and thus GHG emissions.

Baseline Emissions

Streetlights

The number of existing and future streetlights within the City was determined based on information provided by City staff. Baseline electricity consumption by City streetlights was calculated using the following equation:

Energy Consumption = [(Incandescent lights) * (Streetlight profile) * (wattage)] + [(LED lights) * (wattage)] * 365 days * 11 hours

Traffic Signals

The number of existing and future traffic signals within the City was determined based on information provided by City staff. Baseline electricity consumption by City traffic signals was calculated using the following equation.

Energy Consumption = [(Total signals) * (incandescent wattage)] – [(LED lights) * (incandescent wattage) * 90%] * 365 days * 24 hours

Outdoor Lights (Private)

Electricity usage from outdoor lighting in existing residential and commercial developments was estimated by multiplying the total anticipated energy use in 2020 under BAU conditions by 4.7% and 5.8%, respectively. Reductions achieved by overlapping State (e.g., Title 24 and Assembly Bill [AB] 1109) were then removed to obtain baseline energy consumption.

Emissions Reductions

Streetlights

As part of Energy-2, it was assumed that 50% streetlights would be replaced with energy-efficient fixtures. Electricity consumption associated with these new LED bulbs was quantified assuming an average LED wattage of 0.12. The difference in electricity usage between the LED bulbs and the BAU electricity usage represents the energy reductions achieved by the measure. GHG emissions savings were calculated by multiplying the energy reductions by the appropriate utility emission factors.

Traffic Lights

Energy reductions associated with the installation of 189 LED traffic signals was calculated by multiplying the baseline energy consumption by 90%, which is the anticipated reduction in electrical demand (CAPCOA 2010). Emissions savings were then quantified by multiplying the energy reductions by the appropriate utility emission factors.

Outdoor Lights (Private)

Energy reductions associated with the installation of CFL blubs in existing outdoor residential and commercial lighting fixtures was calculated by multiplying the baseline energy consumption by 25% (penetration rate) and then by 75%, which is the anticipated reduction in electrical demand (EPA 2011). GHG emissions reductions were then quantified by multiplying the energy reductions by the appropriate

utility emission factors.

Cost Analysis

Several elements factor in to the overall cost of this measure. More energy-efficient bulbs are typically more expensive than less efficient bulbs, and thus, the installation of more efficient ones incurs incremental (additional) materials costs. In terms of maintenance costs, however, because the rated life of more efficient bulbs is typically longer than less efficient ones, more efficient bulbs generally result in maintenance cost savings. In addition, because the replacement of less efficient bulbs with energy-efficient ones reduces energy consumption, energy cost savings are also realized.

Measure Energy-2a – Municipal Streetlights and Traffic Signals

Total capital costs to the City to replace traffic signals and streetlights are estimated at $3.5–$8.1 million (mid-point of $5.8 million), with an estimated payback period of about 5–13 years. Annual cost savings to the City (including both reduced maintenance needs and energy cost savings) are estimated at about $0.6–$0.7 million. Cost per ton is estimated to range from -$844/MTCO$_2$e to $193/MTCO$_2$e.

Municipal Streetlights

The number of streetlights to be replaced was estimated by the GHG Analysis. To estimate initial costs, this number was multiplied by the incremental cost per fixture, which ranged from $350 to $825, as reported in DOE street lighting case studies for San Francisco and Palo Alto (Energy Solutions 2008; PNNL 2010). Annual incremental maintenance cost savings per fixture were also estimated based on reported values from these case studies, which ranged from approximately $15 to $27 per fixture.

Annual energy cost savings were calculated by multiplying the mitigated electricity usage—as calculated in the GHG Analysis—by PG&E utility rates.[20] A lifetime of 17 years was assumed for this measure, based on the rated life and estimated annual hours of operation.

Municipal Traffic Lights

The number of traffic lights to be replaced was estimated by the GHG Analysis. To estimate initial costs, this number was multiplied by the incremental cost per signal, or approximately $193, assuming a standard three 12" (red, yellow, and green) balls per signal (Western Pacific Signal 2011; eLightBulbs 2011).

To estimate maintenance cost savings, the incremental material cost per signal plus installation replacement cost[21] was multiplied by an assumed 100% of bulbs replaced per year for an incandescent signal versus 20% replaced per year for an LED signal (NYSERDA n.d.).

Annual energy cost savings were calculated by multiplying the mitigated electricity usage—as calculated in the GHG Analysis—by PG&E utility rates.[22] A lifetime of 5 years was assumed for this measure (NYSERDA n.d.).

Measure Energy-2b – Private Outdoor Lighting

Total initial costs to private building owners are estimated to range from about $4.3–$5.7 million, resulting in a payback period of about 2–3 years. Annual cost savings to private building owners are estimated to range from $2.1–$2.3 million. Cost per ton is estimated to range from -$1,222/ton to -$1,076/ton.

Residential Outdoor Lighting

The total number of outdoor bulbs replaced in existing residential development was calculated using the following equation:

Number of bulbs replaced = 25% replaced * (Electricity usage from outdoor lighting in existing

[20] In the absence of streetlight utility rates, small commercial rates were applied.

[21] Installation/replacement was assumed to take approximately one hour (the same as streetlight replacement, as estimated by CPUC 2009), at an average labor rate of $71.14 per hour (CPUC 2009), scaled using a Sacramento multiplier provided by CPUC (2009).

[22] In the absence of traffic signal utility rates, small commercial rates were applied.

residential development in 2020) / [(Incandescent wattage) * (Annual operating hours)]

Electricity usage from outdoor lighting in existing residential development was calculated by the GHG Analysis. Incandescent wattage was assumed to range from 60 to 100 Watts. Annual operating hours were assumed to be 1,136 (CPUC 2009). This equation yielded a total number of bulbs replaced ranging from approximately 45,000 to 76,000. To estimate initial costs, the number of bulbs replaced was multiplied by the incremental material cost per bulb (replacing incandescent with CFL), estimated to range from approximately $8 to $10 per bulb (CPUC 2009).

Annual energy cost savings were calculated by multiplying the mitigated electricity usage—as calculated in the GHG Analysis—by the average residential PG&E utility rates. A lifetime of 9 years was assumed for this measure (CPUC 2009).

Commercial and Industrial Outdoor Lighting

The total number of outdoor fixtures replaced in existing commercial and industrial development was calculated using the following equation:

Number of fixtures replaced = 25% replaced * (Electricity usage from outdoor lighting in existing commercial and industrial buildings in 2020) / [(Metal Halide wattage) * (Annual operating hours)]

Electricity usage from outdoor lighting in commercial and industrial buildings was calculated by the GHG Analysis. Metal halide wattage was assumed to range from 175 to 320 Watts, and annual operating hours were approximately 4,700 (CPUC 2009; PG&E 2009). This equation yielded a total number of fixtures replaced ranging from approximately 5,400 to 10,000. To estimate initial costs, the number of fixtures replaced was multiplied by the incremental material cost per fixture, estimated to range from approximately $380 to $938 per lamp (Peterson 2011; PG&E 2009).

To estimate maintenance cost savings, the incremental material cost per fixture plus installation replacement cost[23] was multiplied by an assumed 58% of bulbs replaced per year for an incandescent versus 9% replaced per year for an LED bulb (based on a rated life of 8,000 hours for the metal halide and 50,000 hours for an LED) (Peterson 2011).

Annual energy cost savings were calculated by multiplying the mitigated electricity usage—as calculated in the GHG Analysis—by the appropriate commercial and industrial PG&E utility rates. A lifetime of 11 years was assumed for this measure, based on Peterson (2011).

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-2.

 **Reduced Energy Use:** Energy-efficient lighting (e.g., CFL fixtures) consumes, on average, 75% less electricity than incandescent bulbs.

 **Reduced Air Pollution:** Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity).

 **Increased Property Values**: Energy efficient bulidings have higher properity values and resale prices than less efficient buildings.

[23] Installation/replacement was assumed to take 90 minutes (PG&E 2009), at an average labor rate of $71.14 per hour (CPUC 2009), scaled using a Sacramento multiplier provided by CPUC (2009).



Increased Quality of Life: CFLs have a much longer lifetime than incandescent bulbs, resulting in reduced bulb turn-over and the need to purchase new fixtures.

Energy-3: Energy Efficiency Incentives and Programs to Promote Retrofits for Existing Residential Buildings [V]

Measure Description

Through the Green-Up Stockton Ordinance, incentivize and support voluntary energy efficiency retrofits of existing residential buildings to achieve reductions in natural gas and electricity usage.

Assumptions

The following assumptions were considered.

- Market penetration of 15% for energy audits.
- Of homes that complete energy audits, 50% would perform energy retrofits.
- 50% of homes completing energy retrofits would perform the following basic retrofits.
  - Replace interior high use incandescent lamps with CFLs.
  - Seal air leaks.
- 40% of homes completing energy retrofits would perform the following advanced retrofits.
  - Replace interior high use incandescent lamps with CFLs.
  - Seal ducts and air leaks.
  - Install a programmable thermostat.
  - Replace windows with double-pane solar-control low-E argon gas wood frame windows.
- 10% of homes completing energy retrofits would perform the following premium retrofits.
  - Replace interior high use incandescent lamps with CFLs.
  - Seal ducts and air leaks.
  - Install a programmable thermostat.
  - Replace windows with double-pane solar-control low-E argon gas wood frame windows.
  - Insulate the attic.
  - Replace electric clothes dryers with natural gas dryers
  - Replace natural gas furnaces with an ENERGY STAR labeled model
- Anticipated energy reductions associated with the above retrofits are
  - Basic retrofits: 938 kWh and 87 therms per single family home (U.S. DOE 2011a)
  - Advanced retrofits: 996 kWh and 329 therms per single family home (U.S. DOE 2011a)
  - Premium retrofits: 2,416 kWh and 398 therms per single family home (U.S. DOE 2011a)

In addition to using the assumptions made to quantify the GHG reductions, the cost analysis also employs numerous additional assumptions, described in the Analysis Details below.

Analysis Details

GHG Analysis

Existing buildings generate a considerable amount of GHG emissions. Older developments are typically less energy-efficient and therefore consume greater amounts of electricity and natural gas, relative to newly constructed facilities.

Baseline Emissions

Baseline emissions were not utilized in the analysis of this measure.

Emissions Reductions

Energy savings associated with retrofitting were estimated using the Home Energy Saver™ (HES), which is based on models and data developed at DOE's Lawrence Berkley National Laboratory (U.S. DOE 2011a). HES estimates energy savings, emission reductions, and costs associated with various energy-efficient measures. For this analysis, energy-efficient upgrades were assumed to be conducted on an average single family home in the City of Stockton, built in 1978 with a square footage of 1740 (U.S. Census 2011c).[24] Upgrades assumed to be performed included: upgrading to CFLs in all high-use indoor lights, switching to a gas clothes dryer, installing an ENERGY STAR-labeled programmable thermostat, installing energy-efficient windows, duct and air sealing, switching to an ENERGY STAR gas furnace, and installing attic insulation.

The magnitude of GHG emissions achieved by energy-efficient retrofitting is dependent on the degree of implementation. Based on professional experience, it was assumed that 15% of existing households would conduct an energy-audit. Of these, half would implement basic energy-efficient retrofits, 40% would implement advanced energy-efficient retrofits, and 10% would implement premium energy-efficient retrofits. Total energy reductions were estimated by multiplying the resulting number of homes by the estimated electricity and natural gas reductions per home, as estimated by HES. GHG emissions savings were then quantified by multiplying the energy reductions by the appropriate utility emission factors.

Cost Analysis

Total initial costs to homeowners are estimated to range from $24 –$51 million. These retrofits are expected to result in energy cost savings of about $6 million per year, delivering a payback period of 4–9 years. Cost-per-ton is estimated to range from -$300/$MTCO_2e$ to -$193/$MTCO_2e$.

Initial costs associated with conducting home energy audits were estimated based on the total number of participating homes (as calculated by the GHG Analysis), the cost per square foot for home audits, and the average single family home size (U.S. Census 2011c). The cost per square foot for home energy audits depends on building size and the complexity of home energy systems, and can range from $0.03 for a light and heating, venting, and air conditioning (HVAC) audit to $0.50 for a comprehensive audit (AECOM 2010).

Initial capital costs associated with energy-efficient retrofitting were estimated for the basic, advanced, and premium upgrade options described above. The retrofit cost per home was estimated to range from about $900 to $1,800 for basic retrofits, $1,900 to $4,600 for advanced retrofits, and $3,700 to $6,400 for premium retrofits (U.S. DOE 2011a). These initial costs can be mitigated through available incentives. Per household incentives were estimated at up to $1,700, including rebates from Energy Upgrade California and PG&E, as well as federal tax incentives.[25]

Annual energy cost savings were calculated by multiplying the mitigated electricity and natural gas usage for each retrofit level—as calculated by HES—by the average residential PG&E utility rates. A lifetime of 18 years was assumed for this measure, based on the lifetimes of individual energy-efficient upgrades reported in CPUC (2009).

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-3.



Reduced Energy Use: Energy retrofits would improve the efficiency of residential buildings. As such, the amount of energy (e.g., electricity, natural gas) consumed per unit of activity would be lowered.



Reduced Air Pollution: Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity) and local air pollution (from reduced burning of natural gas).

[24] For other assumptions, the model defaults were employed.

[25] $1,000 per home is assumed for Energy Upgrade California; $500 is assumed for a federal tax credit; and $150 for attic insulation and $200 for duct sealing is assumed for PG&E.

 **Increased Property Values**: Energy-efficient homes have higher properity values and resale prices than less efficient homes.

 **Public Health Improvements**: Reduced regional and local air pollution would contribute to overall improvements in public health. A well-built, energy-efficient structure is also more durable and directly reduces certain health aliments. For example, properly sealed ducts and air leaks helps prevent mold and dust mites that can cause asthma.

 **Increased Quality of Life**: The reduction of health aliments (see above) contributes to increased quality of life. Additionally, energy-efficient homes improve general comfort by equalizing room temperatures and reducing indoor humidity.

Energy-4: Energy Efficiency Incentives and Programs to Promote Retrofits for Existing Non-Residential Buildings [V]

Measure Description

Incentivize and support voluntary energy efficiency retrofits of existing non-residential buildings to achieve reductions in natural gas and electricity usage. Promote voluntary programs for existing facilities to improve building-wide energy efficiency by 20% by 2020.

Assumptions

Quantification of this measure employs assumptions 38–42, 63–65, 69, 73–75, and 102 in Table C-1. Assumptions also considered were:

- Market penetration of 15% for energy audits and retrofits.
- Electricity and natural gas usage by existing commercial development remains constant between 2005 and 2020.

In addition to using the assumptions made to quantify the GHG reductions, the cost analysis also employs numerous additional assumptions, described in the Analysis Details below.

Analysis Details

GHG Analysis

Existing buildings generate a considerable amount of GHG emissions. Older developments are typically less energy-efficient and therefore consume greater amounts of electricity and natural gas, relative to newly constructed facilities.

Baseline Emissions

The GHG Inventory quantified electricity and natural gas emissions associated with existing commercial development in 2005 (Appendix A). These emissions were assumed to remain constant in 2020 and represent 2020 baseline emissions.

Emissions Reductions

The magnitude of GHG emissions achieved by this measure is dependent on the degree of implementation. It was assumed that 15% of commercial developments would perform an energy audit, and of those, 100% would actual perform the energy retrofits. Energy reductions from a 20% reduction in building energy consumption were therefore quantified by multiplying baseline electricity and natural gas usage by 15% and then by 20%. GHG savings were then quantified by multiplying the energy reductions by the appropriate utility emission factors.

Cost Analysis

Total initial costs to retrofit existing non-residential buildings for a 5-20% energy efficiency improvement are estimated at $4.2–6.4 million, including the cost of energy audits. These retrofits are expected to result in significant energy cost savings for non-residential buildings of $4.6 million per year, with a payback period of 1–2 years. Cost-per-ton is estimated to range from -$430/$MTCO_2e$ to -$415/$MTCO_2e$.

Initial costs of conducting building energy audits were estimated based on the total square footage of participating commercial buildings (as calculated by the GHG Analysis, based on existing commercial development in 2005 and the penetration rate), and the cost per square foot for energy audits. The cost per square foot for building energy audits depends on building size and the complexity of energy systems, and can range from $0.03 for a light and HVAC audit to $0.50 for a comprehensive audit (AECOM 2010).

Initial capital costs associated with energy-efficient retrofits or retrocommissioning are estimated to range from $0.81 to $1.01 per square foot for a 5–20% energy efficiency improvement (AECOM 2010; Gregerson

1997).[26] Incentives are available to offset these capital costs; PG&E offers $0.09/kWh and $1.00/therm for retrocommissioning projects, with the total incentive capped at 50% of the measure cost (PG&E 2011b).

Annual energy cost savings were calculated by multiplying the mitigated electricity and natural gas usage—as calculated by the GHG Analysis—by the average commercial PG&E utility rates. A lifetime of 18 years was assumed for this measure, based on the lifetimes of individual energy-efficient upgrades reported in CPUC (2009).

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-4.

 **Reduced Energy Use:** Energy retrofits and standards would improve the efficiency of commercial buildings. As such, the amount of energy (e.g., electricity, natural gas) consumed per unit of activity would be lowered.

 **Reduced Air Pollution:** Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity) and local air pollution (from reduced burning of natural gas).

 **Increased Property Values**: Energy-efficient bulidings have higher properity values and resale prices than less efficient buildings.

 **Public Health Improvements**: Reduced regional and local air pollution would contribute to overall improvements in public health. A well-built, energy-efficient structure is also more durable and directly reduces certain health aliments. For example, properly sealed ducts and air leaks helps prevent mold and dust mites that can cause asthma.

 **Increased Quality of Life**: The reduction of health aliments (see above) contributes to increased quality of life. Additionally, energy efficient structures improve general comfort by equalizing room temperatures and reducing indoor humidity. Employee satisfaction and out may therefore be increased.

[26] The lower bound cost is based on estimated costs of retrocommissioning, as reported by Gregerson (1997), and adjusted to 2011 dollars using the Bureau of Labor Statistics Consumer Price Index Inflation Calculator.

Energy-5: Solar Powered Parking [V]

Measure Description

Support programs to encourage existing commercial development and multi-family housing complexes to install solar panels on carports. Establish a goal for 15% of existing development (including any existing solar parking installed after 2005) to install solar panels over carports by 2020.

Assumptions

Quantification of this measure employs assumptions 14–16, 38–42, 63–65, 69, 73–75, and 101–102 in Table C-1. The following assumptions were also considered.

- An average of 1.5 parking spaces is required per multifamily dwelling unit (City of Stockton Code of Ordinance (16.64.040)).
- An average of 1 parking space is required per 200 square feet of commercial floor space in buildings smaller than 50,000 square feet (City of Stockton Code of Ordinance (16.64.040)).[27]
- An average of 1 parking space is required per 500 square feet of commercial floor space in buildings greater than 50,000 square feet (City of Stockton Code of Ordinance (16.64.040)).[19]
- Parking spaces are 171 square feet (City of Stockton Code of Ordinance (16.64.080)).
- 50% of multifamily parking space is covered.
- 10% of commercial parking space is covered, and of that, 25% is stacked.
- Each solar system would generate 2,393 kWh per year (SAM Output).
- Penetration rate of 15%.

In addition to using the assumptions made to quantify the GHG reductions, the cost analysis also employs additional assumptions described in the Analysis Details below.

Analysis Details

GHG Analysis

Utilizing electricity generated by renewable resources displaces electricity demand that would ordinarily be provided by PG&E. Although PG&E purchases a substantial amount of energy from renewable sources, electricity supplied by PG&E still represents a source of indirect GHG emissions. Carbon neutral sources, such solar, do not emit GHGs (CAPCOA 2010). Renewable energy supplied through this measure can be used to power building energy or sold to the local utility.

Baseline Emissions

Baseline emissions were not utilized in the analysis of this measure.

Emissions Reductions

It was assumed that the City has approximately 23,615 multi-family homes and 25.5 million square feet of commercial floor space (Fehr & Peers 2011b). Based on professional experience in preparing CAPs for other jurisdictions in California, it was assumed that 15% of this development would comply with the measure.

According to City's parking regulations, a minimum of 1.5 parking spaces must be provided per multi-family home. It was assumed all spaces would be 171 square feet. Total available roof space available for PV installation was therefore calculated by multiplying the number of dwelling units by the number and size of required parking. This value was then reduced by half as it was assumed only 50% of parking space would be covered.

The City's parking regulations outline requirements for several types of commercial developments, including retail/businesses, manufacturing, warehouse, and industry. The number of spaces required for

[27] Applies to "Business and Professional Services"

"business and professional services" was used to calculate the number of new parking spaces subject to this measure. It was assumed that each space would be 171 square feet and that 10% of the available parking area would be covered. Based on professional experience approximately 25% of covered parking area would be stacked, and therefore unsuitable for PV installation.

The SAM model was used to calculate the energy potential of each solar installation.[28] This value was multiplied by the available parking space to determine energy reductions achieved by the measure. GHG reductions were then quantified by multiplying the energy reductions by the appropriate utility emission factors.

Cost Analysis

Costs were developed using the NREL SAM. Costs were calculated on a per-project basis, and then multiplied by the number of projects.

Different scenarios were developed for the cost analysis: (1) an owner-financed scenarios (with a 30-year lifetime) where the initial cost of the project is paid in cash (0% financing), (2) a Power-Purchase Agreement (PPA) scenario (with a 25-year lifetime) in which the initial costs are paid by a solar provider and the solar provider and the building owner share in the operational savings over time. These financing scenarios represent the bounds of the cost estimate range.

Initial Costs

Initial costs include the direct capital costs (e.g., the cost of the system equipment) as well as the indirect costs (e.g., the cost of labor to install it). These costs are driven by project size (assumed to be 1.71 kW per project, based on size of each parking spot and the assumption of 10 watts of solar production per square foot for this area of the country (Sacramento Municipal Utility District 2011). For the owner-financed scenario, these costs amount to $9,771 per commercial project and $9,343 per residential project. These cost estimates are calculated by SAM using default values. The total number of projects undertaken is assumed to be 4,048 (including both residential and commercial installations), based on assumptions used in the GHG Analysis for total area available for installations, as well as the assumed average size of a parking space (171 square feet).

Total upfront costs to building developers/owners for the owner-financed scenarios to install solar panels on carports are estimated to be $38 million, depending on financing terms. Upfront costs for the PPA scenario are assumed to be borne by the solar provider at no cost to the building owner.

Residential projects are eligible for the California Capacity-Based Incentive (CBI) which equates to $427 per residential project assumed in this analysis. Incentives received depend on when the projects are initiated and can change over time. The initial costs are also eligible for a federal ITC of 30% of the initial costs, which results in Federal tax savings. However, this credit is taken at the end of the initial year to align with a lag time in receiving tax credits for project expenditures.

Because this measure targets carports and rooftops, it was assumed that sufficient infrastructure is already in place on which to install the panels. If solar panels are installed in an uncovered parking lot, additional infrastructure would need to be installed, such as the addition of a pole or other structure on which to hang the panels. This additional cost typically amounts to about $1.30 per watt, or about $2,230 per parking space.[29]

Net Annual Energy Cost Savings

The value of electricity is calculated by multiplying the average PG&E residential and commercial electrical rates by the annual production of electricity.

Electricity production is based on the nameplate capacity (assumed to be 1.71 kW per project, as determined by the GHG calculations) and on Sacramento-area climate and latitude information (which affects solar exposure). Stockton-specific climate and latitude information was not available, so

[28] Please refer to Energy-6 for additional information on the SAM Model.

[29] Costs will vary. This estimate is based on industry knowledge.

Sacramento was used as a proxy. Electricity production decreases slightly each year due to system degradation.[30]

Cost savings are estimated at approximately $430 in 2020 reduced by the annual operating costs, which are assumed to be approximately $41 per project in 2020, as calculated by SAM. These costs increase slightly each year to account for inflation.

Total Costs or Savings

Under the owner-financed scenario, these solar installations are expected to have a payback period of 17 year for residential projects and 13 years for commercial projects. Cost-per-ton overall for this measure under the owner-financed scenario is estimated as $10/MTCO$_2$e.

For the PPA scenario, costs/savings presented in this study are from the perspective of the building owner and thus payback for the PPA scenario are nearly immediate, given that PPA arrangements usually result in lower power costs from the initiation. Cost-per-ton (from the building owner-perspective) is estimated to be $-349/MTCO$_2$e.

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-5.

 **Reduced Air Pollution:** Solar systems provide a direct source of renewable electricity. If this energy is consumed onsite, electricity usage supplied by PG&E would be reduced. The energy may also be sold to the utility, where it would be incorporated into their overall energy supply mix. In either scenario, electricity is displaced by a renewable source, which would reduce fossil fuel combustion at power stations and contribute to cumulative reductions in criteria pollutants.

 **Waste Reduction:** The generation of electricity from fossil fuels (e.g., coal, natural gas) generates a substantial amount of waste including, but not limited to: fly ash, bottom ash, flue gas, and sludge. These products can have detrimental effects on the environment if absorbed into groundwater, soil, and/or biota. The extraction and mining of fossil fuels also generates waste. Increasing renewable energy production would reduce waste created by fossil fuel supplied power.

 **Energy Diversity and Security:** Fuels that are traded in the open market are subject to energy supply constraints and interruptions from political unrest, conflict, and trade embargoes. Centralized power structures (e.g., stations, sub-stations, refineries, ports) may also be targets of energy terrorism. Facilities that generate a portion of their electrical demand from domestic, renewable sources would likely be buffered by any potential energy insecurities.

 **Reduced Price Volatility:** Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, energy prices would likely be subject to fluctuations and frequent price spikes. Facilities that diversify their energy supply mix through the generation of renewable energy would likely be buffered from the volatile global energy market.

[30] Note that the 1.71 kW–per-project nameplate capacity assumes a system that is equivalent to the size of a parking space. In reality, many installations over carports will cover a greater area, and larger installations may experience some cost efficiencies. However, there is no "average" size of installation applicable to this measure, and the cost efficiencies gained by assuming larger project sizes are relatively minor compared to the effect of the rates and incentives.

 **Economic Development**: Solar panel installation would create new jobs within the local economy.

 **Public Health Improvements**: Reduced regional air pollution and waste generation would contribute to overall improvements in public health.

 **Increased Property Values**: Bulidings with renewable infrasturcutre have higher properity values and resale prices than conventioanl buildings.

Energy-6: Residential and Non-Residential Rooftop Solar [V]

Measure Description

Encourage businesses and residents to install rooftop solar using Power Purchase Agreements and other low or zero up-front cost options for installing solar photovoltaic systems. Establish the following local renewable energy goals:

- **Existing Commercial Developments**: 10% of electricity in 2020 provided entirely by solar.
- **Existing Residential Developments**: 5% of electricity in 2020 provided entirely by solar.

Assumptions

Quantification of this measure employs the assumptions 63–65, 69, 73–75, in Table C-1. The following assumptions were also considered.

- Energy would be supplied by a carbon neutral resource, such as wind or solar power.

Three implementation strategies to meet the renewable energy goal are considered in the cost analysis, each with different assumptions, as described below.

Analysis Details

GHG Analysis

Utilizing electricity generated by renewable resources displaces electricity demand that would ordinarily be provided by PG&E. Although PG&E purchases a substantial amount of energy from renewable sources, electricity supplied by PG&E still represents a source of indirect GHG emissions. Carbon neutral sources, such solar, do not emit GHGs (CAPCOA 2010).

Baseline Emissions

City-wide electricity in 2005 was obtained from the GHG Inventory (Appendix A). Reductions achieved by all overlapping state and local energy efficiency measures (e.g., Enegy-1, Energy-2) were subtracted to calculate the energy baseline.

Emissions Reductions

A number of the City's CAP measures would reduce existing commercial and residential electricity use (e.g., Energy-2, Energy-5). Total electricity reductions achieved by these measures were subtracted from the baseline 2005 electricity use to obtain the amount of electricity affected by Eneryg-6 (6 million kWh of commercial electricity and 27 million kWh of residential electricity [89 million kWh in total]).

Carbon neutral sources do not emit GHGs. The 89 million kWh affected by this measure would therefore result in a 100% reduction in emissions, relative to BAU conditions. GHG emissions reductions achieved by Energy-6 were quantified by multiplying 89 million kWh by the appropriate utility emission factors.

Cost Analysis

Costs were developed using the NREL SAM. Costs were calculated on a per-project basis, and then multiplied by the number of projects. Different scenarios were developed for the cost analysis: (1) An owner-financed scenario (with a 30-year lifetime) where the initial cost of the project is paid in cash (0% financing) and (2) a Power-Purchase Agreement (PPA) scenario (with a 25-year lifetime) in which the initial costs are paid by a solar provider and the solar provider and the building owner share in the operational savings over time. These financing scenarios represent the bounds of the cost estimate range.

Initial Costs

Initial costs include the direct capital costs (e.g. the cost of the system equipment) as well as the indirect costs (e.g. the cost of labor to install it). These costs are driven by project size (assumed to be 224 kW per commercial project and 5 kW per residential project), and amount to $1,027,488 per commercial project and $27,320 per residential project. These cost estimates are calculated by SAM using default values. The total number of projects undertaken is assumed to be 203 commercial projects and 4,061 residential projects, based on assumptions used in the GHG Analysis, the total kWh needed to meet the target, and the

calculated electricity output per project in 2020).

For the owner-financed scenario, total upfront capital costs for residential building owners associated with this strategy are estimated as $111 million and for commercial building owners are estimated as $209 million. Upfront costs for the PPA scenario are assumed to be borne by the solar provider at no cost to the building owner.

Residential projects are eligible for the California Capacity-Based incentive (CBI) incentive which equates to $1,250 per residential project assumed in this analysis. Incentives can change over time, so actual incentives received depend on when the projects are initiated. The initial costs are also eligible for a federal ITC of 30% of the initial costs, which results in federal tax savings as well. However, this credit is taken at the end of the initial year to align with a lag time in receiving tax credits for project expenditures.

Net Annual Energy Cost Savings

The value of electricity is calculated by multiplying the average PG&E commercial and residential electrical rates by the annual production of electricity. Electricity production is based on the nameplate capacity and on Sacramento-area climate and latitude information (which affects solar exposure). Stockton-specific climate and latitude information was not available, so Sacramento was used as a proxy. Electricity production decreases slightly each year due to system degradation.

Cost savings are reduced by the annual operating costs, which are assumed to be approximately $30,000 in 2020 (not accounting for any tax deductions) per commercial project and approximately $120 per residential project in 2020, as calculated by SAM. These costs increase slightly each year to account for inflation.

Total Costs or Savings

Under the owner-financed scenarios, these solar installations are expected to have a payback period of 17 years for residential projects and 20 years for commercial projects. Cost-per-ton for this measure is estimated as $60/MTCO$_2$e for the lifetime of the measure under the owner-financed scenario indicating a net cost.

For the PPA scenario, costs/savings presented in this study are from the perspective of the building owner and thus payback for the PPA scenario are nearly immediate, given that PPA arrangements usually result in lower power costs from the initiation. Cost-per-ton (from the building owner-perspective) is estimated to be $-208/MTCO$_2$e.

Co-Benefit Analysis

The following benefits are expected from implementation of Energy-6.



Reduced Air Pollution: Generating 51% of community electricity through renewable sources would displace a significant portion of electricity generated by fossil fuels. As such, combustion at regional power stations would be reduced, contributing to cumulative reductions in criteria pollutants.



Waste Reduction: The generation of electricity from fossil fuels (e.g., coal, natural gas) generates a substantial amount of waste including, but not limited to: fly ash, bottom ash, flue gas, and sludge. These products can have detrimental effects on the environment if absorbed into groundwater, soil, and/or biota. The extraction and mining of fossil fuels also generates waste. Increasing renewable energy production would reduce waste created by fossil fuel supplied power.



Energy Diversity and Security: Fuels that are traded in the open market are subject to energy supply constraints and interruptions from political unrest, conflict, and trade embargoes. Centralized power structures (e.g., stations, sub-stations, refineries, ports) may also be targets of energy terrorism.

Providing a diversified and domestic energy supply reduces foreign fuel dependency.

 **Reduced Price Volatility:** Energy supply constraints and the uneven global distribution of fossil fuels increase the instability of the energy market. As the demand for global fossil fuels rises, energy prices would likely be subject to fluctuations and frequent price spikes. Renewables would contribute to the diversification of the energy supply mix, thereby buffering the local economy from the volatile global energy market.

 **Economic Development**: Development of renewable energy infrastructure (e.g., solar farms, wind turbines) would create new jobs, taxes, and revenue for the local economy.

 **Public Health Improvements**: Reduced regional air pollution and waste generation would contribute to overall improvements in public health.

 **Increased Property Values**: If renewable infrastcuture is added to Stockton-area buildings as a result of this measure, properity and resale values of those structures may be increased.

Trans-1: Land Use/Transportation System Design Integration [CITY,V]

Measure Description

This measure includes integration of land use and transportation planning including an infill goal for new units in the Greater Downtown and promotion of a balance of jobs and housing in new village areas and throughout the city. Density would increase through implementation of the Settlement Agreement goal of 3,000 new residential units in the Greater Downtown Area (primarily north of Charter Way, east of Pershing Avenue, south of Harding Way, and west of Wilson Way). The City would also promote greater land use diversity by promoting a balance of jobs and housing all new village areas throughout the City as part of new development. The City would promote these efforts through implementation of new General Plan Amendments for the Greater Downtown area, a new Greater Downtown Stockton Area Specific Plan, potential facilitation of demonstration projects, promotion of incentives for downtown and other infill, and requirements for balance of jobs and housing in new development areas.

Assumptions

Quantification of this measure employs the assumptions 1, 122, 125, and 126 in Table C-1.

Analysis Details

GHG Analysis

Numerous elements of the built environment have an effect on travel behavior, including density, floor-area-ratio (FAR), housing type balance, allowable land uses, and the integration of residential and non-residential uses. These elements relate to the four "Ds" of Smart Growth planning: density, diversity, design, and destinations. Research has found there to be a link between the Ds and travel behavior; when destinations are close together – due to density – people are more likely to take modes other than private vehicles. Likewise, positive pedestrian design leads to fewer vehicle trips as mixed use development has the potential to reduce vehicle trips and vehicle usage by providing adjacent services that can be accessed by walking (Fehr & Peers 2011a).

Baseline Emissions

The GHG Inventory quantified emissions associated with on-road transportation in 2020 under BAU conditions (Appendix A). Reductions achieved by overlapping state measures[31] (e.g., Pavely I) were subtracted to obtain baseline emissions for the transportation sector. Because the measure primarily affects light-duty vehicles, baseline emissions from light-duty autos were quantified by multiplying transportation emissions by 0.55.[32]

Emissions Reductions

Based on modeling conducted by Fehr & Peers (Fehr & Peers 2011c), Trans-1 was assumed to result in a VMT reduction of 76,412, daily miles (70,746 miles from density measures and 5,636 miles from diversity measures), or 1.2% of total miles under 2020 BAU conditions (Attachment C-2). Implementation of the measure is not anticipated to significantly affect the distribution vehicle speeds within the City (Tellez pers. comm.). Consequently, the percent reduction in VMT was assumed to be commensurate with the percent reduction in GHGs. Emission reductions associated with this measure were therefore calculated by multiplying the percent reduction in VMT by the baseline emissions for light-duty autos. The total greenhouse gas reduction if the 3,000 unit goal were met in 2020 would be 7,181MT CO_2e.

Due to the substantial challenges in promoting 3,000 units in the Greater Downtown Area compared to the historically low amount of net new growth in the downtown area (62 net new units from 2002 – 2011), analysis was done of a substantially lower amount of downtown residential growth to examine the impact on greenhouse gas reductions. For this sensitivity analysis, an alternative assumption of 300 units in the

[31] Reductions from overlapping local measures were not removed as the analysis prepared by Fehr & Peers took care to avoid double counting VMT reductions between all measures.

[32] Value based on an EMFAC2007 model run for San Joaquin County in 2020. Light-duty auto assumed to represent "light-duty auto (PC)," "light-duty trucks (T1)," and "light-duty trucks (T2)."

downtown area was assumed. If this were to occur, then Trans-1 would only result in a VMT reduction of 15,326 daily miles (9,690 miles from density measures and 5,636 miles from diversity measures), or 0.2% of total miles under 2020 BAU conditions (Attachment C-1, Fehr & Peers 2011a). If this much more limited amount of net new growth downtown were to occur, the total greenhouse gas reduction in 2010 would be only 1,440 MT CO_2e.

The sensitivity analysis of a potential lower amount than the 3,000 unit goal is for analytical and disclosure purposes only and does not reflect a change in the City's goal for the Greater Downtown area.

Cost Analysis

While not quantified, initial costs would depend on cost differential between downtown development and outlying development. Costs may be negative or positive depending on site development, building rehabilitation, site cleanup and infrastructure costs.

The City may experience cost savings based on increased efficiencies (and thus, reduced costs) of providing and maintaining public services such as utility lines, roadways, increased pumping costs, and other services. The level of cost savings would depend upon the City's approach to increasing densities, and reducing sprawl. However, the City could also incur costs that are related to updating development codes, and public development construction costs, if applicable.

Potential costs for increased transit service by RTD were not estimated separately for this measure as they are assumed to be included in the costs estimated for the Transit Plan (see discussion under Trans-6 and Appendix D).

If the 3,000 unit goal were achieved by 2020, then residents may experience a maximum annual cost savings of $12 million from reduced VMT; however, they may also incur additional costs for substitute modes of transportation, such as bus fares. The cost savings associated with reduced VMT were calculated by multiplying the number of VMT reduced, as calculated in the GHG Analysis, by $0.19 per mile for fuel cost savings and $0.24 per mile for non-fuel cost savings, including reduced oil, tires, maintenance and repair, and depreciation (Caltrans 2010).

For the sensitivity analysis, if only 300 units were achieved by 2020, then residents may experience a maximum annual cost savings of only $2.4 million from reduced VMT; however, as noted above, they may also incur additional costs for substitute modes of transportation, such as bus fares.

Co-Benefit Analysis

The following benefits are expected from implementation of Trans-1.

 **Reduced Energy Use:** Increased density would reduce the number of private vehicle trips made within the City. As a result, gasoline and diesel consumption would be reduced.

 **Reduced Air Pollution**: Because less petroleum would be consumed by vehicles within the city, air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide[15], and ozone precursors[16], would be reduced. Likewise, reductions in congestion from fewer vehicles on the roadway network would contribute reductions in emissions generated by vehicle idling.

 **Public Health Improvements**: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.

 **Energy Security**: In 2009, 51% of petroleum consumed by the U.S. was imported from oversees (EIA 2010). Reducing fuel consumption would lessen the demand for petroleum and ultimately the

demand for imported oil.

 **Increased Quality of Life**: Increased density along transit routes, employment corridors, and in the downtown would increase the accessibility of public transportation and basic services. Reductions in the number of vehicle trips may also reduce congestion and travel times.

 **Smart Growth**: Increased density in the urban core is a form of smart growth development that creates more walkable and accessible environments.

Trans-2: Parking Policies [M]

Measure Description

Encourage the development of policies that increase parking costs by 10% in the downtown area and reduce parking requirements for new development by 20% in the downtown outside the central parking district and 10% elsewhere in the City. Support strategies to achieve this goal. Such as designating the most attractive spots for rideshare vehicles and offering incentives for employees not to park in the downtown.

Assumptions

Quantification of this measure employs the assumptions 1, 122, 125, and 127 in Table C-1.

Analysis Details

GHG Analysis

Parking attributes—such as price, location, and availability—can influence parking behavior. Some people are willing to walk longer distances to get free parking, while others may choose to ride transit in an area with high parking prices and limited parking availability. Likewise, employees may opt to take transit instead of driving if they can receive financial incentives (Fehr & Peers 2011a).

Baseline Emissions

The GHG Inventory quantified emissions associated with on-road transportation in 2020 under BAU conditions (Appendix A). Reductions achieved by overlapping state measures[33] (e.g., Pavely I) were subtracted to obtain baseline emissions for the transportation sector. Because the measure primarily affects light-duty vehicles, baseline emissions from light-duty autos were quantified by multiplying transportation emissions by 0.55.[34]

Emissions Reductions

Based on modeling conducted by Fehr & Peers, Trans-2 was assumed to result in a VMT reduction of 16,570 daily miles (14,302 miles in the downtown area and 2,268 miles in the remainder of the City), or 0.3% of total miles under 2020 BAU conditions (Attachment C-1). Implementation of the measure is not anticipated to significantly affect the distribution vehicle speeds within the City (Tellez pers. comm.). Consequently, the percent reduction in VMT was assumed to be commensurate with the percent reduction in GHGs. Emission reductions associated with this measure were therefore calculated by multiplying the percent reduction in VMT by the baseline emissions for light-duty autos.

Cost Analysis

No significant upfront costs are anticipated for this measure. Limited capital costs (estimates as $25,000) would be necessary for new meters and signage. The City will also incur a range of costs associated with changing parking pricing structures, including additional staff time to enforce increased parking prices, costs of creating signage for new prices, and the installation of new meters, if necessary. Studies have shown that increases in parking fees generally result in increased revenue, and thus this measure is considered to have limited net cost to the City (TRB 2005).

Potential costs for increased transit service by RTD were not estimated separately for this measure as they are assumed to be included in the costs estimated for the Transit Plan (see discussion under Trans-6 and Appendix D).

Residents might expect maximum annual cost savings of $2.6 million from reduced VMT; however, additional costs for substitute modes of transportation (e.g., bus fares) may offset these savings. The cost savings associated with reduced VMT were calculated by multiplying the number of VMT reduced, as calculated in the GHG Analysis, by $0.19 per mile for fuel cost savings and $0.24 per mile for non-fuel cost

[33] Reductions from overlapping local measures were not removed as the analysis prepared by Fehr & Peers took care to avoid double counting VMT reductions between all measures.

[34] Value based on an EMFAC2007 model run for San Joaquin County in 2020. Light-duty auto assumed to represent "light-duty auto (PC)," "light-duty trucks (T1)." and "light-duty trucks (T2)."

savings, including reduced oil, tires, maintenance and repair, and depreciation (Caltrans 2010).

Co-Benefit Analysis

The following benefits are expected from implementation of Trans-2.

 **Reduced Energy Use:** Higher parking prices would reduce the number of private vehicle trips made within the City. As a result, gasoline and diesel consumption would be reduced.

 **Reduced Air Pollution**: Because less petroleum would be consumed by vehicles within the city, air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide[15], and ozone precursors[16], would be reduced. Likewise, reductions in congestion from fewer vehicles on the roadway network would contribute reductions in emissions generated by vehicle idling.

 **Public Health Improvements**: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.

 **Energy Security**: In 2009, 51% of petroleum consumed by the U.S. was imported from oversees (EIA 2010). Reducing fuel consumption would lessen the demand for petroleum and ultimately the demand for imported oil.

 **Increased Quality of Life**: While higher parking prices may cause frustration amongst some motorists, it would reduce the number of vehicle trips within the City, contribution to improvements in roadway efficiency and travel times.

Trans-3: Transit System Support [CITY]

Measure Description

Encourage the development of transit support facilities (such as bus shelters) as well as 200 new park and ride spaces.

Assumptions

Quantification of this measure employs the assumptions 1, 122, 125, and 128 in Table C-1.

Analysis Details

GHG Analysis

Although the City of Stockton is not a transit provider, the City can encourage the development of transit support facilities (e.g., bus shelters and new park and ride facilities) (Fehr & Peers 2011a). These amenities would help reduce transit passenger travel time and may make transit service more attractive.

Baseline Emissions

The GHG Inventory quantified emissions associated with on-road transportation in 2020 under BAU conditions (Appendix A). Reductions achieved by overlapping state measures[35] (e.g., Pavely I) were subtracted to obtain baseline emissions for the transportation sector. Because the measure primarily affects light-duty vehicles, baseline emissions from light-duty autos were quantified by multiplying transportation emissions by 0.55.[36]

Emissions Reductions

Based on modeling conducted by Fehr & Peers, Trans-3 was assumed to result in a VMT reduction of 13,532 daily miles (1,438 miles from bus shelters and 12,093 miles from park and ride spaces), or 1% of total miles under 2020 BAU conditions (Attachment C-1). Implementation of the measure is not anticipated to significantly affect the distribution vehicle speeds within the City (Tellez pers. comm.). Consequently, the percent reduction in VMT was assumed to be commensurate with the percent reduction in GHGs. Emission reductions associated with this measure were therefore calculated by multiplying the percent reduction in VMT by the baseline emissions for light-duty autos.

Cost Analysis

Initial capital costs involved in implementing this measure include construction costs to expand the existing park-and-ride system and provide transit supportive facilities. Expanding the existing park-and-ride system could cost the City about $500,000 in initial construction costs. Initial costs for upgrading bus shelters, benches, and intersections to traffic signal priority are estimated at $150,000.

Upgrading Transit Support Facilities

Based on modeling conducted by Fehr & Peers, five bus shelters and benches were assumed to upgraded, along with 10 intersections upgraded to traffic signal priority. The cost per shelter and bench was estimated at $20,000 each, and $5,000 for each intersection (Tellez pers. comm.). A lifetime of 20 years was assumed for this measure.

Expanding Park-and-Ride System

The cost of this measure was based on publicly available information on the costs incurred by other jurisdictions, such as Cecil County, Maryland (Grant et al. 2008). An average cost to construct an additional space in an existing park-and-ride lot was estimated at approximately $2,500. Total costs were estimated assuming the addition of 200 spaces to the City's existing 265 spaces. Annual maintenance costs were estimated at approximately $49,000. A lifetime of 12 years was assumed for this measure (Grant et al. 2008).

[35] Reductions from overlapping local measures were not removed as the analysis prepared by Fehr & Peers took care to avoid double counting VMT reductions between all measures.

[36] Value based on an EMFAC2007 model run for San Joaquin County in 2020. Light-duty auto assumed to represent "light-duty auto (PC)," "light-duty trucks (T1)," and "light-duty trucks (T2)."

Cost Savings[37]

Residents might expect maximum annual cost savings of $2.1 million from reduced VMT; however, additional costs for substitute modes of transportation (e.g., bus fares) may offset these savings. The cost savings associated with reduced VMT were calculated by multiplying the number of VMT reduced, as calculated in the GHG Analysis, by $0.19 per mile for fuel cost savings and $0.24 per mile for non-fuel cost savings, including reduced oil, tires, maintenance and repair, and depreciation (Caltrans 2010).

Transit Service Costs

Potential costs for increased transit service by RTD were not estimated separately for this measure as they are assumed to be included in the costs estimated for the Transit Plan (see discussion under Trans-6 and Appendix D).

Co-Benefit Analysis

The following benefits are expected from implementation of Trans-3.

 **Reduced Energy Use:** More attractive transit would encourage motorists to utilize public transportation instead of private vehicles. As a result, the number of vehicle trips made within the City, and thus gasoline and diesel consumption, would be reduced.

 **Reduced Air Pollution**: Because less petroleum would be consumed by vehicles within the City, air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide[15], and ozone precursors[16], would be reduced. Likewise, reductions in congestion from fewer vehicles on the roadway network would contribute reductions in emissions generated by vehicle idling.

 **Public Health Improvements**: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.

 **Increased Quality of Life**: Transit amenities would help reduce transit passenger travel time and may make public transportation more comfortable and enjoyable. Reductions in the number of vehicle trips may also reduce congestion and travel times.

[37] This analysis does not account for the value of travel time, which may increase upon a shift to BRT, or disbenefits to automobile drivers who continue to drive; these costs would require detailed analysis beyond the scope of this CAP.

Trans-4: Efficient Goods Movement [CITY]

Measure Description

Construct grade-separated crossings on Eight Mile Road, Lower Sacramento Road, and Sperry Road.

Assumptions

Quantification of this measure employs the assumptions 1, 122, 123, 124, and 129 in Table C-1.

Analysis Details

GHG Analysis

There are a number of at-grade railroad crossings throughout the City, including those on Eight Mile Road, Lower Sacramento Road, and Sperry Road. These at-grade crossings contribute to vehicle delay, especially when freight trains pass through the crossings. Longer freight trains have been observed to block intersections in Stockton for significant periods of time, increasing vehicle idling and in some instances creating congestion on alternate routes that avoid the crossing. Providing grade-separated crossings where rail lines and roadways intersect can reduce idling and traffic diversions (Fehr & Peers 2011a).

Baseline Emissions

The GHG Inventory quantified emissions associated with on-road transportation in 2020 under BAU conditions (Appendix A). Reductions achieved by overlapping state measures[38] (e.g., heavy-duty vehicle hybridization) were subtracted to obtain baseline emissions for the transportation sector. Because the measure primarily affects medium- and heavy-duty vehicles, baseline emissions from these vehicles were quantified by multiplying transportation emissions by 0.44.[39]

Emissions Reductions

Based on modeling conducted by Fehr & Peers, Trans-4 was assumed to result in a VMT reduction of 10,251 daily miles or 0.1% of total miles under 2020 BAU conditions (Attachment C-1). Implementation of the measure is not anticipated to significantly affect the distribution vehicle speeds within the City (Tellez pers. comm.). Consequently, the percent reduction in VMT was assumed to be commensurate with the percent reduction in GHGs. Emission reductions associated with this measure were therefore calculated by multiplying the percent reduction in VMT by the baseline emissions for medium- and heavy-duty vehicles.

Cost Analysis

Grade separation projects have substantial upfront construction costs but these projects are already planned and separately funded and thus are not additional costs that would be incurred if the CAP were adopted and implemented. Residents and businesses would also experience savings from reduced VMT but these would happen with or without the CAP.

Co-Benefit Analysis

The following benefits are expected from implementation of Trans-4.



Reduced Energy Use: efficient grade crossing would reduce congestion and vehicle idling, which would improve vehicle fuel economy. As a result, less gasoline and diesel fuel would be consumed.



Reduced Air Pollution: Because less petroleum would be consumed by vehicles within the City,

[38] Reductions from overlapping local measures were not removed as the analysis prepared by Fehr & Peers took care to avoid double counting VMT reductions between all measures.

[39] Value based on an EMFAC2007 model run for San Joaquin County in 2020. Light-duty auto assumed to represent "light-duty auto (PC)", "light-duty trucks (T1)" and "light-duty trucks (T2)".

air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide[15], and ozone precursors[16], would be reduced. Likewise, reductions in congestion would contribute reductions in emissions generated by vehicle idling.



Public Health Improvements: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.



Increased Quality of Life: Reduced vehicle congestion would improve the efficiency of the transportation network. The distribution of goods and services may also be increased, enabling consumers to

Trans-5: Reduce Barriers for Non-Motorized Travel [CITY]

Measure Description

Reduce physical barriers to bicycle and pedestrian networks by providing additional bicycle lanes and implementing the Multi Modal Street Design Guidelines.

Assumptions

Quantification of this measure employs the assumptions 1, 122, 125, and 130 in Table C-1.

Analysis Details

GHG Analysis

Cycling is a non-emissions forming mode of transportation that has a high potential for success in Stockton. By encouraging implementation of the City's adopted Bicycle Master Plan, existing gaps in the network can be filled. Beyond this, providing facilities for bicycle commuters, such as showers and bicycle lockers, can encourage them to use this mode for short and medium length trips (Fehr & Peers 2011a).

Baseline Emissions

The GHG Inventory quantified emissions associated with on-road transportation in 2020 under BAU conditions (Appendix A). Reductions achieved by overlapping state measures[40] (e.g., Pavely I) were subtracted to obtain baseline emissions for the transportation sector. Because the measure primarily affects light-duty vehicles, baseline emissions from light-duty autos were quantified by multiplying transportation emissions by 0.55.[41]

Emissions Reductions

Based on modeling conducted by Fehr & Peers, Trans-5 was assumed to result in a VMT reduction of 15,520 daily miles or 0.2% of total miles under 2020 BAU conditions (Attachment C-1). Implementation of the measure is not anticipated to significantly affect the distribution vehicle speeds within the City (Tellez pers. comm.). Consequently, the percent reduction in VMT was assumed to be commensurate with the percent reduction in GHGs. Emission reductions associated with this measure were therefore calculated by multiplying the percent reduction in VMT by the baseline emissions for light-duty autos.

Cost Analysis

The costs for this measure were based on the City of Stockton's Bicycle Master Plan (City of Stockton 2007), as completed in 2007. The capital costs of installing bikeway facilities is estimated to range from $75,000 to $600,000 per mile, assuming Class I or II facilities. A total of 18 miles are assumed to be constructed by 2020, for a total capital cost ranging from $1.4–$11 million. Annual maintenance costs for bikeway facilities range from $5,000 to $10,000 per mile, or up to $90,000–$180,000 (midpoint of $135,000) per year by 2020. Additional costs would also be incurred for bicycle storage and shower facilities, multi-modal street design guidelines, and the purchase and maintenance of bicycles and associated equipment. The City would also incur limited costs for staff time to amend the City Zoning Code and to conduct planning and project administration.

Bicyclists might expect maximum annual cost savings of $2.4 million from reduced VMT. The cost savings associated with reduced VMT were calculated by multiplying the number of VMT reduced, as calculated in the GHG Analysis, by $0.19 per mile for fuel cost savings and $0.24 per mile for non-fuel cost savings, including reduced oil, tires, maintenance and repair, and depreciation (Caltrans 2010).

A lifetime of 20 years was assumed for this measure. Cost-per-ton (including the value of reduced VMT) is estimated to range from -$1,555/MT$CO_2$e to -$1,079/MTCO_2e.

[40] Reductions from overlapping local measures were not removed as the analysis prepared by Fehr & Peers took care to avoid double counting VMT reductions between all measures.

[41] Value based on an EMFAC2007 model run for San Joaquin County in 2020. Light-duty auto assumed to represent "light-duty auto (PC)," "light-duty trucks (T1)," and "light-duty trucks (T2)."

Co-Benefit Analysis

The following benefits are expected from implementation of Trans-5.

 **Reduced Energy Use:** Providing network connections and facilities for bicycle commuters, such as showers and bicycle lockers, can encourage them to use non-motorized transportation for short and medium length trips. As a result, the number of vehicle trips made within the City, and thus gasoline and diesel consumption, would be reduced.

 **Reduced Air Pollution**: Because less petroleum would be consumed by vehicles within the City, air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide[15], and ozone precursors[16], would be reduced. Likewise, reductions in congestion from fewer vehicles on the roadway network would contribute reductions in emissions generated by vehicle idling.

 **Public Health Improvements**: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity. Walking and bicycling would also provide exercise, which may help reduce obesity and other ailments caused by inactivity.

 **Increased Quality of Life**: Improving the connectivity of the pedestrian and bicycle network would increase public mobility. Amenities like showers and lockers may also make bicycling and walking more enjoyable. Finally, reductions in the number of vehicle trips may reduce congestion and travel times.

 **Smart Growth**: Creating a more walkable and accessible environment is a tenant of smart growth development.

Trans-6: Transit System Improvements [CITY]

Measure Description

Expand transit system network and increase service frequency through implementation of the City's Transit Plan.

Assumptions

None

Analysis Details

GHG Analysis

A Transit Plan was developed for the City that identifies service improvements and enhancements that could be implemented over the life of the CAP to increase ridership. Strategies include provision of additional bus rapid transit routes, realignment of existing and planned routes, and increasing service in terms of frequency and geography. An increase in ridership from approximately 3% to 5% mode share is a desired outcome of the transit plan. However, no funding mechanisms to provide the desired increase in transit ridership are currently available. It is therefore assumed that not all of the Transit Plan recommendations will be implemented and the primary function of RTD's operational planning and the Transit Plan will be to keep transit mode share at existing levels (3%). As transit mode share is expected to remain the same relative to existing conditions, no reduction in VMT or GHG emissions are associated with the CAP (Fehr & Peers 2011a).

Cost Analysis

As described in City of Stockton's Climate Action Plan – Transit Plan and Program, RTD would need additional annual operating budget of $8.3 million above 2011 budget levels just to keep the current transit mode share of 3% (Nelson Nygaard 2011). Additional service improvements in the Transit Plan would include $2.5 million in upfront capital costs, including the purchase of buses to support expansion of service, as well as $2.9 million in incremental annual transit operating costs. Depending on the strategies implemented, some of these costs could be borne by private developers.

Co-Benefit Analysis

The following benefits are expected from implementation of Trans-6.



Reduced Energy Use: More attractive transit would encourage motorists to utilize public transportation instead of private vehicles. As a result, the number of vehicle trips made within the City, and thus gasoline and diesel consumption, would be reduced.



Reduced Air Pollution: Because less petroleum would be consumed by vehicles within the City, air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide[15], and ozone precursors[16], would be reduced. Likewise, reductions in congestion from fewer vehicles on the roadway network would contribute reductions in emissions generated by vehicle idling.



Public Health Improvements: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.



Increased Quality of Life: Increased transit service would help reduce transit passenger travel time and may make public transportation more comfortable and enjoyable. Reductions in the number of vehicle trips may also reduce congestion and travel times.

Trans-7: Safe Routes to School [CITY]

Measure Description

Work with local school districts to enhance pedestrian crossings, encourage activities such as a *walking school bus*[42], and create educational programs that teach students bicycle safety.

Assumptions

Quantification of this measure employs the assumptions 1, 122, 125, and 132 in Table C-1.

Analysis Details

GHG Analysis

Ridesharing programs reduce the number of school-related vehicle trips, thereby reducing GHG emissions.

Baseline Emissions

The GHG Inventory quantified emissions associated with on-road transportation in 2020 under BAU conditions (Appendix A). Reductions achieved by overlapping state measures[43] (e.g., Pavely I) were subtracted to obtain baseline emissions for the transportation sector. Because the measure primarily affects light-duty vehicles, baseline emissions from light-duty autos were quantified by multiplying transportation emissions by 0.55.[44]

Emissions Reductions

Based on modeling conducted by Fehr & Peers, Trans-7 was assumed to result in a VMT reduction of 21,132 daily miles or 0.3% of total miles under 2020 BAU conditions (Attachment C-1). Implementation of the measure is not anticipated to significantly affect the distribution vehicle speeds within the City (Tellez pers. comm.). Consequently, the percent reduction in VMT was assumed to be commensurate with the percent reduction in GHGs. Emission reductions associated with this measure were therefore calculated by multiplying the percent reduction in VMT by the baseline emissions for light-duty autos.

Cost Analysis

Assuming 20 projects are undertaken at a cost of about $200,000 to over $500,000 each, total costs to the City could range from about $4–$11 million (midpoint of $7.5 million). In addition, it was estimated that the City would also incur annual operational and maintenance costs of $172,500.

The cost per capital improvement project to improve safe routes to schools was based on the previous experiences of the City of Stockton and Marin County, California (Transportation Authority of Marin 2006). The City of Stockton's project to help improve Fillmore Elementary School's sidewalks and various drainage systems was assumed to be the lower range of per project costs, at $206,000. An infrastructure project in Marin County was assumed to be the upper range of per project costs, at about $535,000. It was assumed that the City would implement 20 projects over a four year period.

Walkers and bicyclists might expect maximum annual cost savings of $3.3 million from reduced VMT. The cost savings associated with reduced VMT were calculated by multiplying the number of VMT reduced, as calculated in the GHG Analysis, by $0.19 per mile for fuel cost savings and $0.24 per mile for non-fuel cost savings, including reduced oil, tires, maintenance and repair, and depreciation (Caltrans 2010).

Cost-per-ton (including the value of reduced VMT) is estimated to range from -$1,483/$MTCO_2e$ to -$1,210/$MTCO_2e$.

[42] A walking school bus is a group of children walking to school with one or more adults.

[43] Reductions from overlapping local measures were not removed as the analysis prepared by Fehr & Peers took care to avoid double counting VMT reductions between all measures.

[44] Value based on an EMFAC2007 model run for San Joaquin County in 2020. Light-duty auto assumed to represent "light-duty auto (PC)," "light-duty trucks (T1)," and "light-duty trucks (T2)."

Co-Benefit Analysis

The following benefits are expected from implementation of Trans-7.

 **Reduced Energy Use:** Providing traffic calming and other bicycling infrastructure to improve pedestrian safety near schools would encourage more students to walk and bike. As a result, the number of school-related vehicle trips, and thus gasoline and diesel consumption, would be reduced.

 **Reduced Air Pollution**: Because less petroleum would be consumed by vehicles within the City, air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide[15], and ozone precursors[16], would be reduced. Likewise, reductions in congestion from fewer vehicles on the roadway network would contribute reductions in emissions generated by vehicle idling.

 **Public Health Improvements**: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity. Walking and bicycling would also provide exercise, which may help reduce obesity and other ailments caused by inactivity.

 **Increased Quality of Life**: Pedestrian and bicycle crossing near schools would enhance mobility and access. Improvements in public safety would also be realized. Finally, reductions in the number of vehicle trips may reduce congestion and travel times.

 **Smart Growth**: Creating a more walkable and accessible environment is a tenant of smart growth development.

Trans-8: Transportation Demand Management and Additional Safe Routes to School [CITY, V]

Measure Description

This measure included two measures: Trans-8a - Work with local school districts to expand the Safe Routes to School Program (Trans-7) to achieve a participation rate of 10% of K-12 students; Trans-8b - Encourage employers within the City, County, and region to take actions that would result in at least 1% of employees participating in a Transportation Demand Management Program.

Assumptions

Quantification of this measure employs the assumptions 1, 122, 125, and 133 in Table C-1.

Analysis Details

GHG Analysis

There are numerous modifications to travel behavior that the average citizen can undertake that could result in large VMT reductions. Small changes to daily travel routines, such as walking children to school one day a week, working from home one day a month and/or using an alternative mode of transportation, such as biking, transit or carpooling, to work one day at month could result in significant reductions should a large enough proportion of the population alter their travel behavior. (Fehr & Peers 2011a.)

Baseline Emissions

The GHG Inventory quantified emissions associated with on-road transportation in 2020 under BAU conditions (Appendix A). Reductions achieved by overlapping state measures[45] (e.g., Pavely I) were subtracted to obtain baseline emissions for the transportation sector. Because the measure primarily affects light-duty vehicles, baseline emissions from light-duty autos were quantified by multiplying transportation emissions by 0.55.[46]

Emissions Reductions

Based on modeling conducted by Fehr & Peers, Trans-8 was assumed to result in a VMT reduction of 54,668 daily miles, or 0.9% of total miles under 2020 BAU conditions (Attachment C-1).

A reduction of 21,132 miles are attributable to additional safe routes to school (Measure Trans-8a). The TDM program (Measure Trans-8b) is estimated to result in reductions of 9,350 miles within the City, 4,383 miles within the County, and 19,803 miles within the region. Implementation of the measure is not anticipated to significantly affect the distribution vehicle speeds within the City (Tellez pers. comm.). Consequently, the percent reduction in VMT was assumed to be commensurate with the percent reduction in GHGs. Emission reductions associated with this measure were therefore calculated by multiplying the percent reduction in VMT by the baseline emissions for light-duty autos.

Cost Analysis

Measure Trans-8a represents a similar level of effort for safe routes to school as those estimated for Trans-7 above and thus the capital costs, O&M costs, and vehicle/fuel savings would be the same as Trans-7.

For Measure Trans-8b, employers, schools, and other entities would experience additional costs to fund and implement travel demand reduction programs, while employees (and students) would incur benefits through reduced vehicle/fuel expenses. These costs were not quantified due to the diversity of costs associated with different TDM approaches.

The City would incur implementation costs to implement both parts of this measure as discussed in

[45] Reductions from overlapping local measures were not removed as the analysis prepared by Fehr & Peers took care to avoid double counting VMT reductions between all measures.

[46] Value based on an EMFAC2007 model run for San Joaquin County in 2020. Light-duty auto assumed to represent "light-duty auto (PC)", "light-duty trucks (T1)" and "light-duty trucks (T2)".

Chapter 4 of the CAP.

Co-Benefit Analysis

The following benefits are expected from implementation of Trans-8.

 **Reduced Energy Use:** Providing traffic calming and other bicycling infrastructure to improve pedestrian safety near schools would encourage more students to walk and bike. Likewise, TDM strategies, such as flex schedules and transit passes, would reduce commute-related traffic. As a result, the number of vehicle trips within the City, and thus gasoline and diesel consumption, would be reduced.

 **Reduced Air Pollution**: Because less petroleum would be consumed by vehicles within the City, air pollutants generated by fossil fuel combustion, including particulate matter, carbon monoxide, sulfur dioxide[15], and ozone precursors[16], would be reduced. Likewise, reductions in congestion from fewer vehicles on the roadway network would contribute reductions in emissions generated by vehicle idling.

 **Public Health Improvements**: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity. Walking and bicycling would also provide exercise, which may help reduce obesity and other ailments caused by inactivity.

 **Increased Quality of Life**: Safe routes to school programs would enhance mobility and access, as well as contribute to improvements in public safety. TDM may offer more flexibility in employee's schedule and improve their work-life balance. Both programs would contribute to reduced congestion and travel times and a result fewer vehicle trips.

 **Smart Growth**: Creating a more walkable and accessible environment through safe routes to school programs would contribute to smart growth development.

Waste-1: Increased Waste Diversion [M]

Measure Description

Continue to provide public education and collection services to community residents and business. Exceed the waste diversion rate required by AB 341[47] by diverting 75% of community waste by 2020.

Assumptions

The following assumptions were considered for the quantification of this measure.

- The City has an average existing diversion rate of 64% for municipal solid waste (CalRecycle n.d.).

Analysis Details

GHG Analysis

Diversion programs reduce the amount of waste deposited in regional landfills. Because waste generates methane emissions during decomposition, reducing the volume of waste sent to landfills directly reduces GHG emissions. In general, waste diversion rates have risen dramatically since the early 1980s. The U.S. achieved 46% diversion in 2008.

Baseline Emissions

The GHG Inventory projected 2020 waste volumes for the City using historic landfill data obtained from CalRecycle. According to CalRecycle (n.d.), the City diverted 64% of generated waste in 2005. It was assumed that this diversion rate would remain constant under 2020 baseline conditions.

Emissions Reductions

Implementation of Waste-1 would increase the baseline diversion rate to 75%. The amount of waste diverted by material type under baseline conditions was therefore increased by 11% (75% minus 64%). GHG emissions that would have been generated by the diverted waste if it had been deposited in regional landfills were quantifying using CARB's FOD Model and revised disposal information based on a 75% diversion goal.

Cost Analysis

The net costs considered in this analysis are approximations of the costs and revenues borne by the waste management company servicing the City of Stockton, as a result of the increased diversion rate assumed in this measure.[48] Costs of collecting and processing recyclables vary widely, and it is difficult to apply generalized estimates to specific companies. While broad estimates of costs are provided, the extent to which these costs are representative of local conditions is uncertain.

Initial costs to increase diversion are assumed to be minimal. The City is already engaged in an outreach effort to increase recycling at multifamily residential buildings, which currently lag far behind single-family homes in recycling participation rates. Therefore, program outreach costs are considered to be negligible.

Net costs are calculated on a per-ton basis, and include the assumptions shown below:

[47] AB 341 increases the statewide diversion goal to 75% by 2020.

[48] While these costs are not borne directly by either the City or by private residents and businesses, the waste management company could choose to pass some or all of the costs on to their customers and/or the City (depending on the specifics of the company's contract with the City). Increasing diversion rates could also result in some savings to building managers; however, these savings were not included in the analysis to avoid double-counting savings.

Cost Component	Estimated Cost per Ton of Recyclables Collected	Sources/Assumptions
Cost of collection	$141	EPA (2008)
Cost of processing recyclables	$46	Assumes medium sized facility that processes 121–218 tons per day (Kessler Consulting Inc. 2009).
Revenue from sale of recyclables	$80	Based on estimated average for 2009-2010 in Humbolt County (ACRC n.d.). Estimate is consistent with professional judgment.
Cost savings from avoided cost disposal	$38	Repa/NSWMA (2005)
Net costs to recycle one ton of MSW	*$69*	

The net cost of $69/ton is multiplied by the additional tons recycled in each year from 2011 to 2020. Since the 2020 GHG emissions are dependent on changes in landfilling amounts during that time period, it is necessary to consider the total costs across all years, rather than only the costs in year 2020. The cost of the increased diversion amounted to about $2.6 million in 2012, increasing to $5.8 million in 2020. Lifetime cost-per-ton is estimated at $942/MT$CO_2$e.

Co-Benefit Analysis

The following benefits are expected from implementation of Waste-1.



Reduced Air Pollution: The decomposition of landfilled waste emits methane, which can react with other species in the atmosphere to form local smog. By sending less waste to regional landfills, methane emissions would be reduced.



Resource Conservation: Waste that is diverted to recycling centers can be converted into reusable products, thereby reducing the need for raw materials.

Water-1: Comply with Senate Bill X7-7 [M]

Measure Description

Comply with SB X7-7 and achieve a 20% reduction in per capita water usage by 2020.

Assumptions

Quantification of this measure employs the assumptions 63–65, 69, 73–75, 81–86, and 134–142 in Table C-1. The following assumptions were also considered.

- 20 X 2020 per capita goal of 165 gallons per person per day (City of Stockton 2011a).

Analysis Details

GHG Analysis

California homes and businesses consume a significant amount of water through indoor plumbing needs and outdoor irrigation. ConSol estimates that an average three-bedroom home uses 174,000 gallons of water each year (ConSol 2010). A large portion of water use can be attributed to inefficient fixtures (e.g., showerheads, toilets). Recognizing that water uses a great deal of electricity to pump, treat, and transport, the state adopted SB X7-7, which requires a 20% reduction in urban per capita use by December 31, 2020 (20X2020 goal). Achieving this goal would not only reduce electricity consumption, but avoid GHG emissions and conserve water.

Baseline Emissions and Emissions Reductions

The City's Urban Wastewater Management Plan establishes a 2020 urban water use target for the City of Stockton Municipal Utilities District (COSMUD)[49] of 165 gallons per capita per day (City of Stockton 2011b).[50] This target represents to the level of water consumption needed to achieve the district's 20X2020 goal.

According to City staff, 2020 water consumption under BAU conditions is projected to be 32,585 million gallons (MG)[51] (Morales pers. comm.; Price pers. comm.). Based on the City's 2020 population, total water consumption in 2020 under SB X7-7 would be 18,693 MG. Achieving the 20X2020 goal would therefore reduce city-wide water consumption in 2020 by 13,893 MG. Electricity savings from reduced water treatment, distribution, and wastewater treatment were quantified by multiplying the anticipated water reductions by the appropriate energy-intensities. GHG savings were then calculated by multiplying the energy reductions by the appropriate utility emission factors.

Cost Analysis

Costs were not quantified due to limitations in data availability. Costs may include the construction of water infrastructure, while savings may include reduced treatment and conveyance costs, as well as reduced water bills for residents and businesses.

[49] The City of Stockton is served by three urban water retailers; the City of Stockton Municipal Utilities Department, the California Water Service Company and San Joaquin County (Morales pers. comm.). Information from the California Water Service and San Joaquin County were unavailable. Consequently, the COSMUD 20X2020 goal was used as a proxy for the city's three urban water retailers.

[50] Represents the target under Method 3, which is the preferred calculation method for COSMUD.

[51] Includes water consumption by sources subject to SB X7-7: residential, commercial, industrial, landscape, and other (unaccounted for water).

Co-Benefit Analysis

The following benefits are expected from implementation of Water-1.

 **Resource Conservation:** Reduced water consumption would help conserve freshwater resources.

 **Reduced Energy Use:** Water uses a great deal of electricity to pump, treat, and transport. Consequently, reductions in water use would reduce electricity consumption.

 **Reduced Air Pollution:** Reduced electricity use would contribute to reductions in regional air pollution.

 **Increased Property Values**: Energy-efficient bulidings have higher properity values and resale prices than less efficient buildings.

Water-2: Promotion of Water-Efficiency for Existing Development [V][52]

Measure Description

Encourage existing buildings achieve higher levels of water efficiency. Education and outreach programs can help educate individuals on the importance of water efficiency and how to reduce water use. Rebate programs can help promote installation of water-efficient plumbing fixtures.

Assumptions

Quantification of this measure employs the assumptions 63–65, 69, 73–75, 81–86, and 134–194 in Table C-1. The following assumptions were also considered.

- The following voluntary CALGREEN measures would be implemented by development.
  - Installation of water efficient appliances and plumbing fixtures (showerheads, faucets, toilets, urinals, and dishwashers).
  - Installation of graywater systems.
  - Use of low-water irrigation systems.
- 15% market penetration for residential and 15% market penetration for commercial (consistent with Energy-3 and Energy-4).

In addition to using the assumptions made to quantify the GHG reductions, the cost analysis also employs assumptions 227–234, as well as additional assumptions described in the Analysis Details below.

Analysis Details

GHG Analysis

In 2010, the California Building Standards Commission unanimously adopted Title 24 Part 11 (also known as CALGREEN), the mandatory green building standards code and the first such code in the nation. CALGREEN requires all new buildings in the state to be more energy efficient and environmentally responsible. Effective January 1, 2011, CALGREEN requires that every new building constructed in California reduce water consumption by 20%. CALGREEN voluntary measures recommend a 30–40% reduction over baseline in indoor water use and 55–60% reduction over baseline outdoor potable water use.

Baseline Emissions and Emissions Reductions

The methodology described in Water-2 was used to quantify water, energy, GHG emissions reductions associated with this measure. The following assumptions were modified.

- Market penetration of 15% for residential retrofits (consistent with Energy-3).
- Market penetration of 15% for commercial retrofits (consistent with Energy-4).
- Baseline water flow rates were based on the 1992 Energy Policy Act.[53]
- Installation of residential ENERGY STAR certified dishwashers was based on a 15% household penetration rate.

Cost Analysis

[52] Emissions reductions associated with reduced electricity and natural gas for hot water heating will be achieved in the building energy sector. However, these emissions reductions are reported as part of Water-3 as they are a direct result of implementation of water-efficient fixtures.

[53] Because this measure applies to existing developing, assuming baseline flow rates are equivalent to the 2010 building code is inappropriate. According to the City's Housing Element and the EIA, the majority of homes and commercial developments were constructed prior to 1980. Assuming the 1992 flow rate therefore represents a conservative assumption as several developments that comply with this measure will likely replace fixtures with flow rates much higher than required in 1992.

Costs were estimated for upgrading to low-flow plumbing fixtures for bathroom and kitchen faucets, showerheads, and toilets in existing residential buildings. Replacement costs per fixture were estimated at $250 for a low-flow toilet and $50 per low-flow faucet or showerhead (ConSol 2010). To estimate total initial capital costs, this replacement cost was multiplied by the estimated number of plumbing fixtures per home and the number of existing homes in 2012 and 2013, as estimated by the GHG Analysis.

Annual cost savings were calculated by multiplying the mitigated electricity, natural gas, and water usage—as calculated in the GHG Analysis—by the average residential utility rates. An average life time of 10 years was assumed for this measure, based on the effective useful life reported by CPUC (2009) for faucet aerators and low-flow showerheads.

Co-Benefit Analysis

The following benefits are expected from implementation of Water-2.

 Resource Conservation: Efficient appliances and fixtures would reduce water consumption would help conserve freshwater resources.

 Reduced Energy Use: Water uses a great deal of electricity to pump, treat, and transport. Likewise, water consumed during showers, dish washing, and clothes washing require electricity and natural gas to heat the water to a comfortable temperature. Consequently, reductions in water use would reduce energy consumption from pumping, treatment, transporting, and heating.

 Reduced Air Pollution: Reduced energy use would contribute to reductions in regional air pollution (from reduced generation of electricity) and local air pollution (from reduced burning of natural gas).

 Increased Property Values: Energy-efficient bulidings have higher property values and resale prices than less efficient buildings.

Wastewater-1: Energy Efficiency Improvements at the RWCF [CITY] [54]

Measure Description

Implement energy efficiency measures described in the City's Capital and Improvement EMP.

Assumptions

Quantification of this measure employs the assumptions 63–65, 69, 73–75, and 86 in Table C-1. The following assumptions were also considered.

- 12,000 MG of wastewater would be treated at the Regional Wastewater Control Facility in 2020 (City of Stockton 2011a).
- Implementation of the EMP energy efficiency measures would achieve a 5.7% improvement in facility energy efficiency (City of Stockton 2011b).
- The current energy-intensity factor for the Regional Wastewater Control Facility is 2,550 kW/MG [55] (Parlin pers. comm.)

Analysis Details

GHG Analysis

Wastewater generated within the City is currently treated at the RWCF, which is owned and operated by COSMUD. The RWCF treatment process is completed in four stages; the first three stages remove solids and the final stage disinfects effluent prior to discharge into the San Joaquin River. By 2020, over 12,000 MG of wastewater are expected to undergo this process at the RWCF. Collection and treatment of the wastewater would generate fugitive methane emissions from organic decomposition, as well as GHGs from electricity consumption.

Baseline Emissions

Baseline emissions were not utilized in the analysis of this measure.

Emissions Reductions

By 2020, over 12,000 MG of wastewater are expected to be treated and collected at the RWCF (City of Stockton 2011a). According to the City's EMP, implementation of the selected energy efficiency measures would achieve a 5.7% reduction in energy use for wastewater treatment (City of Stockton 2011b). According to COSMUD, the current energy-intensity for wastewater treatment is 2,550 kWh/MG (Parlin pers. comm.). Electricity savings associated with implementation of the EMP was therefore calculated by multiplying the current energy-intensity by 0.057, and then by the anticipated gallons of wastewater to be treated in 2020 (12,000 MG). GHG reductions were quantified by multiplying the energy savings by the appropriate utility-specific emission factors.

Cost Analysis

After incentives and rebates, this measure is estimate to require minimal upfront capital costs, $300,000, resulting in a payback period of just 2 years (City of Stockton 2011b). A lifetime of 5–10 years was assumed for this measure. Cost-per-ton is estimated to range from -$357/$MTCO_2e$ to -$259/$MTCO_2e$. Annual energy savings were estimates as $150,000.

[54] GHG emissions associated with electricity consumption at the RWCF were reported in the building energy sector of the GHG Inventory (only fugitive and process emissions were reported in the wastewater sector). Consequently, emissions reductions associated with reduced electricity use will be achieved in the building energy sector. However, these emissions reductions are reported as part of Wastewater-1 as they are a direct result of implementation of the EMP.

[55] Based on 32 MG per day at 3.4 MW.

Co-Benefit Analysis

The following benefits are expected from implementation of Wastewater-1.

 Reduced Energy Use: The collection and treatment of wastewater requires electricity. Improving the efficiency of pumping and treatment equipment would therefore reduce electricity consumption at the RWCF.

 Reduced Air Pollution: Reduced electricity use would contribute to reductions in regional air pollution.

Urban Forestry-1: Urban Tree Planting Programs [CITY] [56]

Measure Description

Strive to expand urban forestry programs to plant between 500 and 900 trees per year from 2016 to 2020. To maximize GHG and other environmental benefits, new trees would be targeted to the downtown and urban areas.

Assumptions

The following assumptions were considered for the quantification of this measure.

- Tree planting programs begin in 2016.
- Assumes mature trees (as opposed to seedlings) would be planted.
- CAPCOA annual sequestration rates (MT CO_2e per year):
  - Soft Maple—0.0433.
  - Hardwood Maple—0.0521.
  - Pine—0.0319.
  - Douglas Fir—0.0447.
- Due to the larger number of trees being planted in later years (e.g., 900 trees in 2020), a scaling factor of 0.5 was used to discount the carbon sequestration benefits of these trees (since newly planted trees generally sequester less carbon than trees which have been planted for a few years and are growing at a consistent rate).

Analysis Details

GHG Analysis

Trees would be planted along transportation corridors and roadways as such they are not assumed to shade buildings which can reduce summer cooling energy consumption. While street trees can also reduce the urban heat island effect through both shading and evapotranspiration. Specific means to quantify this effect and convert to energy reductions were not identified for this measure. Thus, quantification of this measure focused on carbon sequestration. The GHG benefits achieved from tree planting would vary based on the type of tree planted. Mature trees would function to sequester carbon dioxide from the atmosphere.

Baseline Emissions

Baseline emissions were not utilized in the analysis of this measure.

Emissions Reductions

CAPCOA (2010) has quantified anticipated annual CO_2 accumulation rates associated with various tree species. A review of the City's tree planting lists indicates that maple, pine, and fir species are appropriate for planting along City streets and in open spaces. The average CO_2 accumulation rate for these species was multiplying the number of planted trees per year (500 to 900) by the number of planting years (5) and then by a scaling factor of 0.5 (to account for the larger number of trees being planted in later years, as they sequester less carbon than established trees) to obtain total CO_2 sequestered in 2020.

Cost Analysis

Initial costs for planting, staking, and mulching were estimated at $142–$197 per public tree, based on information provided by the City of Stockton, for a total initial cost to the City of between $500,000 and $690,000 (Meissner pers. comm.). Annual maintenance costs were estimated to range from $12 to $56 per tree, depending on the maturity of the trees; irrigation costs are higher in the first five years, whereas infrastructure repair and litigation/liability costs apply after the trees reach a certain size (McPherson et

[56] Emissions reductions associated with reduced electricity for ventilation and cooling will be achieved in the building energy sector. However, these emissions reductions are reported as part of Urban Forestry-1 as they are a direct result of tree-planting programs.

al. 1999).[57] Annual median operations and maintenance costs were estimates as $120,000 in 2020.

To calculate annualized net benefits for this measure, a per-tree lifetime net savings ranging from $417–$597 was assumed, based on an equal mix of small and medium trees planted in the City of Stockton. This value was based on lifetime net savings as reported in a tree study for San Joaquin Valley (McPherson et al. 1999), grossly adjusted to 2011 dollars and net of building energy savings associated with shading, since trees are anticipated to be planted along transportation corridors and roadways. This net benefits value includes CO_2 and air quality emission reductions, as well as property value increases. Actual net costs for the City may vary from those estimated, but the net benefit is expected to be highly positive.

A lifetime of 40 years was assumed for this measure (McPherson et al. 1999). Cost-per-ton (including the value of benefits) is estimated to range from -$1,619/$MTCO_2e$ to -$1,132/$MTCO_2e$.

Co-Benefit Analysis

The following benefits are expected from implementation of Urban Forestry-1.

 **Reduced Energy Use:** Trees planted adjacent to buildings shade, which cools buildings and reduces the need for summer-time air conditioning use. As a result, less electricity is consumed.

 **Reduced Air Pollution:** Reduced electricity use would contribute to reductions in regional air pollution. Trees planted adjacent to congested roadways may also help filter particulate matter and other local pollutants.

 **Reduced Urban Heat Island Effect**: Urban heat isalnd effect occurs when the ambient temperature in urban areas increases as a reuslt of high energy consumption (e.g., air conditioning use during the summertime). Trees provide shade, which reduces the cooling load of buildings and helps mitigate the urban heat island effect.

 **Increased Quality of Life**: Trees improve the aesthetic quality of buildings, as well as reduce stormwater runoff during periods of heavy rain.

[57] These costs were adjusted to 2011 dollars using the Bureau of Labor Statistics Consumer Price Index Inflation Calculator.

High GWP GHG-1: Residential Responsible Appliance Disposal Programs [CITY]

Measure Description

To help residents dispose of their freezers and refrigerators using RAD, with this measure, the City would establish a RAD drop-off center in Stockton. This center would be done by a solid waste vendor under contract to the City

Assumptions

Quantification of this measure employs the assumptions 14–16, 66–67, and 212–226 in Table C-1. The following assumptions were also considered.

- This measure only applies to existing residential developments.
- Market penetration of 15%.
- Approximately 5% of refrigeration and 6% of freezer units would be replaced in 2020 (based on Association of Home Appliance Manufactures 2001).
- Approximately 21% of existing refrigeration and air conditioning units in the City were commissioned prior to 1994 and 79% were commissioned after 1994 (RLW Analytics 2005).
- Calculations do not consider emissions reductions associated with the recovery of refrigerants.
- Chlorofluorocarbon (CFC)-11 is assumed as the foam blowing agent in equipment commissioned prior to 1994. [58]
- Hydrochlorofluorocarbon (HCFC)-141b is assumed as the foam blowing agent in equipment commissioned after 1994. [34]
- EPA estimates that an average of 1 pound of foam blowing agent (CFC-11 and HCFC-141b) per appliance is recovered through its RAD Program (EPA 2010d).

In addition to using the assumptions made to quantify the GHG reductions, the cost analysis also employs additional assumptions described in the Analysis Details below.

Analysis Details

GHG Analysis

RAD reduces emissions of high GWP GHGs through the recovery of appliance foam. The program also recovers refrigerant and recycles metals, plastics, and glass. For the purposes of this analysis, only emissions reductions associated with the recovery and destruction of appliance foam were considered. This assumption is based on the fact that refrigerant recovery is required by law (section 608 of title VI of the Clean Air Act); recovery savings should therefore not be attributed to RAD. Likewise, metals (and often plastics and glass) are typically recycled from disposed appliances within California.

Baseline Emissions

Baseline emissions were not utilized in the analysis of this measure.

Emissions Reductions

According to the Association of Home Appliance Manufactures (AHAM) (2001), refrigerators and freezers have an average lifespan of 20 and 18 years, respectively. New developments constructed between the writing of this document and 2020 would therefore likely not need to dispose of refrigerators or freezers. This measure was therefore assumed to apply only to existing single and multifamily housing units.

A market penetration rate of 15% was used to determine the number of homes participating in RAD. The number and age of existing refrigerators and freezers per household was based on RLW Analytics (2005). Based on the average life span of a refrigerator and freezer (AHAM 2001) it was assumed that 5% and 6% of existing refrigerators and freezers, respectively, would be replaced in 2020 (1/20 and 1/18,

[58] Based on industry and professional knowledge.

respectively).

The Climate Action Reserves' U.S. Ozone Depleting Substances Project Protocol, version 1.0 (2010) was used to estimate emissions reductions associated with the recovery and disposable of appliance foam. The protocol considers emissions associated with the transport, processing, and destruction of recovered foam. Based on information provided by the EPA (2010d), it was assumed that RAD would recover 1 pound of foam blowing agent per refrigerator and freezer.

Cost Analysis

Costs were not quantified due to limitations in data availability. Costs to the City might include initial construction costs to build or renovate a drop-off center, as well as annual operational costs to run the center. The recycling company may also incur additional costs to transport the units for recycling.

Co-Benefit Analysis

No benefits have been identified at this time.

Off-Road-1: Electric Powered Construction Equipment [V]

Measure Description

Offer incentives (e.g., reduced procedural requirements; preference points when bidding on City contracts, partner with CARB or SJVACPD to leverage funding) to construction contractors that utilize electric equipment in at least 20% of their fleet.

Assumptions

Quantification of this measure employs the assumptions 3 and 195–205 in Table C-1.

Analysis Details

GHG Analysis

Utilizing electric power would offset direct GHG emissions from fuel combustion. Indirect emissions from electricity are significantly lower than direct emissions from fuel combustion. Electrifying construction vehicles therefore results in a reduction in GHG emissions.

Baseline Emissions

The GHG Inventory quantified emissions associated with off-road equipment in 2020 under BAU conditions. According to the OFFROAD model output, approximately 25% of off-road emissions, or 51,331 MT CO_2e were generated by construction equipment in the City in 2020. Reductions achieved by overlapping state (e.g., low carbon fuel standard) measures were subtracted from these emissions to obtain baseline emissions for construction equipment.

Emissions Reductions

The OFFROAD2007 model calculates vehicle operating emissions by fuel type (e.g., diesel, gasoline) and average horsepower. Model outputs by vehicle class were multiplied by CAPCOA's anticipated percent reduction in GHG emissions for switching to electric power.

Cost Analysis

Costs were not quantified due to limitations in data availability. Costs would include the cost to purchase electric-powered equipment and increase electricity costs, while savings would result from reduced fuel usage. The City of Stockton would incur limited costs associated with staff time to promote existing financial incentives.

Co-Benefit Analysis

The following benefits are expected from implementation of Off-Road-1.



Reduced Air Pollution: Utilizing electricity in place of diesel would reduce local air pollution.



Public Health Improvements: Diesel combustion release several toxic air containments known to cause adverse human health effects to construction workers. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.



Increased Quality of Life: Electric equipment is quieter and typically easier to maneuver than diesel-powered equipment.

Off-Road-2: Reduced Idling Times for Construction Equipment [M]

Measure Description

Develop an ordinance that limits idling time for heavy-duty construction equipment to 3 minutes.

Assumptions

Quantification of this measure employs the assumption 3 and 206–211 in Table C-1. The following assumptions were also considered.

Analysis Details

GHG Analysis

Equipment idles during rest periods, which requires fuel and results in GHG emissions. Regulating idling time would therefore reduction fuel consumption and GHG emissions.

Baseline Emissions

Baseline emissions from construction equipment idling were quantified using the ratio of idle to operating fuel consumption. Fuel consumption for off-road equipment will vary by type. However, according to the EPA, a typical mid-size track-type tractor consumes 1 gallon of fuel for every one hour at idle (EPA 2009a). Based on an URBEMIS2007 model run for a similar equipment piece, approximately 64 kilograms of carbon dioxide are emitted. Assuming 10.21 kilograms of carbon dioxide per gallon of diesel fuel (Climate Registry 2011), 6.28 gallons of fuel are consumed per hour of operation.

CARB does not regulate idling time for off-road equipment. Anticipated baseline idling times were therefore estimated using case studies of construction equipment. The EPA (2009) estimates that on average, construction equipment spend approximately 29.4% of daily operating time idling. Assuming an average workday of 8 hours, this equates to approximately 141 minutes per day. Based on this assumption, and the estimated gallons of fuel consumed (above), idling emissions were estimated at 2,540 MT CO_2e.

Emissions Reductions

Implementation of Off-Road-2 would reduce idling time to no more than 3 minutes at any one time. Although construction equipment idles for over 141 minutes today, it is unlikely the idling occurs a single time. The CARB's regulations for heavy duty vehicle (5 minutes) was used a proxy to determine the percent reduction in potential idling emissions from implementation of Off-Road-2. Reducing idling time from 5 minutes to 3 minutes is a 40% reduction. Emissions savings associated with this measure were therefore calculated by multiplying baseline idling emissions by 0.40.

Cost Analysis

Several elements factor into the overall cost of this measure. Private businesses would experience cost savings associated with avoided fuel use, reduction in maintenance costs, and engine overhauls; these savings may be offset to the extent that technologies to support idling reduction are adopted. Total upfront costs to install idling reduction technologies are estimated at $1.3–$15 million, with annual cost savings of about $0.5 million, for a payback period ranging from 3 to 30 years. Cost-per-ton for this measure is estimated between -$346/MT$CO_2e$ to $1,517/MT$CO_2e$.

Number of Heavy-Duty Vehicles

Using the expected emissions reductions achieved by implementing this measure, the following equation was used to calculate the number of vehicles that required outfitting with anti-idling technologies:

Number of Vehicles = [2020 Emission Reductions from Heavy Duty Vehicles (MT CO_2e)]/[Emission Reductions per Vehicle from Idling (MT CO_2e)]

Emissions reductions per heavy-duty vehicle were determined by estimating the amount of gallons of fuel used in idling per year (Argonne National Laboratory 2008)[59], assuming that each gallon of gasoline emits

[59] Fuel consumption is calculated to be 0.79 gallons/hour for vehicles that have 900 revolutions per minute, and use the air conditioner 50% of the time the vehicle is running.

19.4 lbs of CO_2 (EPA 2005). Savings from reducing idling time from 5 minutes to 3 minutes were calculated using the following equation:

Idling Emissions/ year = Gallons used in idling/ year * 19.4lbs/year

The above calculation was performed for the current 5 minute/hour idling scenario and the 3 minute/hour idling scenario, and produced a difference of 0.695 MT $C0_2e$/year in emissions. Thus the number of vehicles was estimated at 920 MT $C0_2e$ ÷ 0.695 MT CO_2e, or approximately 1,300 vehicles.

Technology Costs

The measure used recommendations for technologies from the U.S. EPA's Smart Way Transport Partnership (2008). These included automatic engine shutdown/start-up technologies, direct fired heaters, auxiliary power units, and electrification capabilities. The initial per-unit cost of these technologies from $1,000/unit for automatic engine shutdowns/start-ups to $11,000/unit for electrification. The O&M costs of using these technologies are not estimated under this measure. The life spans of these technologies were assumed to be 10 years.

Cost Savings

Savings are mainly derived from avoided O&M costs. Idling often has the same effect on the vehicle as driving it; that is, the engine, and other mechanical parts experience the same wear-and-tear effects. Thus, reduction in idling over time would provide savings in avoided fuel use, reduction in maintenance costs in relation to oil changes, and engine overhauls.

The calculation of annual cost savings from a reduction in idling time (from 5 to 3 minutes) has the following steps. Each calculation is estimated twice—once for a 5-minute idling time and once for a 3-minute idling time—and the difference between the two calculations is the estimate of cost savings.

- Cost of Fuel Use = (Fuel Consumption/hour * hours/year spent idling * fuel price/gallon)
- Cost of Oil Changes = [(Miles per oil change/cost of oil change) * (gallons/hour * hours/year * average fuel economy)]
- Engine Overhaul Costs = [(Miles per overhaul/cost of overhaul) * (gallons/hour * hours/year * average fuel economy)]

Total cost savings are estimated as:

Total Cost Savings = (Savings from Fuel Reduction + Savings from Reduced Oil Changes + Savings from Reduced Engine Overhaul) * Number of Vehicles

Co-Benefit Analysis

The following benefits are expected from implementation of Off-Road-2.

 **Reduced Energy Use:** Equipment idles during rest periods, which requires fuel. Regulating idling time therefore reduces fossil fuel consumption.

 **Reduced Air Pollution:** Reduced idling and fuel combustion would contribute to reductions in toxic air contaminates, ozone precursors, and other inorganic and organic air pollutants.

 **Public Health Improvements**: Construction workers are exposed to pollutants that cause adverse health effects when they work near idling vehicles. By reducing vehicle idling time, exposure periods would be decreased, which may contribute to long-term health improvements.

Off-Road-3: Electric Landscaping Equipment [V]

Measure Description

Through a combination of outreach, education and incentives, pursue a goal for 15% of the City's landscaping equipment to be electric or battery powered by 2020.

Assumptions

Quantification of this measure employs the assumption 3 and 195–205 in Table C-1. The following assumptions were also considered.

Analysis Details

GHG Analysis

Utilizing electric power eliminates 100% of direct GHG emissions from fuel combustion. Indirect emissions from electricity are significantly lower than direct emissions from fuel combustion. Electrifying construction vehicles therefore results in a reduction in GHG emissions.

Baseline Emissions

The GHG Inventory quantified emissions associated with off-road equipment in 2020 under BAU conditions. According to the OFFROAD model output, approximately 3% of off-road emissions or 4,689 MT CO_2e are generated by landscaping equipment. Reductions achieved by overlapping state (e.g., Low carbon fuel standard) measures were subtracted from these emissions to obtain baseline emissions for landscape equipment.

Emissions Reductions

The OFFROAD2007 model calculates vehicle operating emissions by fuel type (e.g., diesel, gasoline) and average horsepower. Model outputs by vehicle class were multiplied by CAPCOA's anticipated percent reduction in GHG emissions for switching to electric power.

Cost Analysis

Costs were not quantified due to limitations in data availability. Costs would include the cost to purchase electric-powered equipment and increase electricity costs, while savings would result from reduced fuel usage. The City of Stockton would incur limited costs associated with staff time to write ordinances.

Co-Benefit Analysis

The following benefits are expected from implementation of Off-Road-3.



Reduced Air Pollution: Utilizing electricity in place of gasoline and diesel would reduce local air pollution.



Public Health Improvements: Fossil fuel combustion release several toxic air containments known to cause adverse human health effects. Reductions in the amount of fuel combusted would result in corresponding reductions in toxic air containments. Additionally, reductions in ozone precursors would reduce the formation of smog, which has numerous human and environmental effects, including respiratory irritation and reduced plant productivity.



Increased Quality of Life: Electric equipment is quieter and typically easier to maneuver than diesel- and gasoline-powered equipment.

References for Appendix C

Printed

AECOM. 2010. As originally cited in the Union City Climate Action Plan. Union City.

Ang-Olson, J., and A. Mahendra. 2011. National Cooperative Highway Research Program. April. from Research Results Digest 352. Available: <http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rrd_352.pdf>. Accessed: July 7, 2011.

Aquacraft, Inc. 1999. Residential Water Use Summary. Available: <http://www.aquacraft.com/Publications/resident.htm>. Accessed: April 15, 2011.

Arcata Community Recycling Center, Inc. (ACRC). (n.d.) Keep Recycling Cool. Available: <http://www.arcatarecycling.org/>. Accessed: July 7, 2011,

Argonne National Laboratory, 2006. How Much Could you Save by Idling Less? Available: <http://www.transportation.anl.gov/pdfs/TA/361.pdf> Accessed: August 9, 2011.

Association of Home Appliance Manufactures. 2001. INFOBulletin #5. Major Appliances and PCB Small Capacitors.

California Air Resources Board (CARB). 2006. EMFAC 2007 Emissions Model. Version 2.3. November 1.

California Air Resources Board (CARB). 2008. Climate Change Scoping Plan Appendices Volume II. December.

California Air Resources Board (CARB). 2011. Status of Scoping Plan Recommended Measures. Available: <http://www.arb.ca.gov/cc/scopingplan/status_of_scoping_plan_measures.pdf>. Accessed: August 17, 2011.

California Air Pollution Control Officers Association (CAPCOA). 2010. Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures. August. Available: <http://www.capcoa.org/wp-content/uploads/downloads/2010/09/CAPCOA-Quantification-Report-9-14-Final.pdf>. Accessed: October 9, 2010.

California Climate Action Registry (CCAR). 2009. General Reporting Protocol. Versi*on 3.1*. Available: <http://www.climateregistry.org/resources/docs/protocols/grp/GRP_3.1_January2009.pdf>. Accessed: August 23, 2010.

California Department of Finance. 2000. Summary of Projections and Findings. Available: <http://www.hcd.ca.gov/hpd/hrc/rtr/chp7r.htm>. Accessed: August 17, 2011.

California Department of Transportation (Caltrans). 2010. California Life-Cycle Benefit/Cost Analysis Model (Cal-B/C) Version 4.1. March 2010. Available: <http://www.dot.ca.gov/hq/tpp/offices/ote/LCBC_Analysis_Model.html>

California Energy Commission (CEC). 2006. California Commercial End-Use Survey. Available: <http://www.energy.ca.gov/ceus>. Accessed: August 18, 2011.

California Energy Commission (CEC). 2007. Renewables Portfolio Standard 2005 Procurement Verification. CEC-300-2007-001-CMF.

California Energy Commission (CEC). 2010. 2009 California Residential Appliance Saturation Survey. CEC-200-2010-004. Table 2-5. Prepared by KEMA, Inc. October.

California High-Speed Rail Authority. High-Speed Rail Project. Availalbie: <http://www.cahighspeedrail.ca.gov/home.aspx>. Accessed: August 18, 2011.

California Public Utilities Commission (CPUC). 2009. Database for Energy Efficient Resources (DEER). Available: <http://www.deeresources.com/index.php?option=com_content&view=category&layout=blog&id=40&Itemid=55>

California Public Utilities Commission (CPUC). 2011. Rates Charts and Tables - Electricity, Bundled customer rates by class from 2000–2011. Available: <http://www.cpuc.ca.gov/PUC/energy/Electric+Rates/ENGRD/ratesNCharts_elect.htm>

CalRecycle. no date. Jurisdiction Profile for City of Stockton. Available: <http://www.calrecycle.ca.gov/profiles/Juris/JurProfile2.asp?RG=C&JURID=517&JUR=Stockton>. Accessed: May 11, 2011.

City of Los Angeles. 2006. Green Roofs—Cooling Los Angeles: A Resource Guide. Prepared by the Environmental Affairs Department.

City of Portland. 2008. Cost Benefit Evaluation of Ecoroofs. Prepared by David Evans and Associates, Inc., for the City of Portland Bureau of Environmental Services.

City of Stockton. 2007. Final. November Retrieved July 7, 2011, from City of Stockton Bicycle Master Plan. Available: <http://www.stocktongov.com/files/BicycleMasterPlan.pdf>. Accessed: September 1, 2011.

City of Stockton. 2010. 2005 Community Emissions Inventory & 2005 Municipal Operations Emissions Inventory. Prepared by Kindelberg Morales. July

City of Stockton. 2011a. Draft 2010 City of Stockton Urban Wastewater Management Plan. K/J Project No. 1170004*00. May.

City of Stockton. 2011b. Draft Capital Improvement and Energy Management Plan. Prepared by Carollo Engineers. May.

City of Stockton. 2011c. Municipal Utilities Department Water Fee Schedule. Available: <http://www.stocktongov.com/government/departments/adminservices/feeschedule.html>. Accessed: July 6, 2011.

Climate Action Reserve (CAR). 2010. U.S. Ozone Depleting Substances Project Protocol, version 1.0. February 3.

Climate Registry (CR). 2011. Default Emission Factors. March.

ConSol. 2010. Water Use in the California Residential Home. January.

Darrow, K., B. Hedman, and A. Hampson. 2009. Combined Heat and Power Market Assessment. California Energy Commission, PIER Program. CEC-500-2009-094-D.

Dethman & Associates. 1999. Dishwasher Surveys Report. Prepared for the Northwest Energy Efficiency Alliance and the Consortium for Energy Efficiency. April 5.

Energy Information Administration (EIA). 2008. 2003 CBECS Detailed Tables. Released September 2008. Available: <http://www.eia.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/detailed_tables_2003.htm>. Accessed: March 15, 2011.

Energy Information Administration (EIA). 2009. 2005 Residential Energy Consumption Survey: Energy Consumption and Expenditures Tables. Last Revised: January 2009. Available: <http://www.eia.doe.gov/emeu/recs/recs2005/c&e/detailed_tables2005c&e.html>. Accessed: March 15, 2011.

Energy Information Administration (EIA). 2010. How Much Petroleum Does the United States Import? Last Revised: September 2010. Available: <http://www.eia.gov/tools/faqs/faq.cfm?id=36&t=6>. Accessed: August 19, 2011.

Energy Solutions. 2008. LED Street Lighting. Host Site: City of San Francisco, California. Final Report prepared in support of the US DOE Solid-State Lighting Technology Demonstration Gateway Program and PG&E Emerging Technologies Program.

Environmental Protection Agency. 2005. Emissions Factors: Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel. Available at <http://www.epa.gov/oms/climate/420f05001.htm>. Accessed August 9, 2011.

Environmental Protection Agency. 2008. Smart Way Idling Technology Program. Available: <http://www.epa.gov/smartway/technology/idling.htm>. Accessed: August 9, 2011.

Fehr & Peers. 2011a. City of Stockton Climate Action Plan (CAP) Implementation, Effect on Vehicle Travel. Memorandum to Laura Yoon, ICF International. November 21.

Fehr & Peers. 2011b. Stockton Climate Action Plan Transportation 2020 Business as Usual VMT Estimates. Memorandum to Tony Held, ICF International. May 10.

Fehr & Peers. 2011c. City of Stockton Climate Action Plan (CAP) Implementation, Effect on Vehicle Travel. Memorandum to Laura Yoon, ICF International. August 3.

Gabel Associates, LLC. 2011. Codes and Standards: Title 24 Energy-Efficient Local Ordinances. Climate Zone 12 Energy Cost-Effectiveness Study (SMUD Electricity & PG&E Gas Rates).

Grant, M., R. Kuzmyak, L. Shoup, E. Hsu, T. Krolik, and D. Ernst. 2008. SAFETEA-LU 1808: CMAQ. Evaluation and Assessment: Phase I Final Report. Available: <http://www.fhwa.dot.gov/environment/air_quality/cmaq/safetealu1808.pdf> Accessed: July 7, 2011

Huffman, et al. 2007. Fact Sheet: AB 1470- Solar Water Heating and Efficiency Act of 2007. Available: <http://www.environmentcalifornia.org/uploads/e2/33/e23381557c9bb00ba563ba66199d6f3d/_Fact_Sheet_AB_1470.pdf>. Accessed: August 17, 2011.

ICF International (ICF). 2011. City of Stockton Inventory Methodology. (Appendix B). August 2011.

ICLEI. 2010. Climate and Air Pollution Planning Assistant. Version 1.5.

International Energy Agency. 2007. Contributions to Renewable Energy Security.

Intergovernmental Panel on Climate Change (IPCC). 1996. *Climate Change 1995: The Science of Climate Change.* Cambridge University Press. Cambridge, United Kingdom.

Judith Buethe Communications. no date. Project Websites: North Stockton Railroad Grade Separations & Bridge Replacement. Available at:<http://www.buethecommunications.com/project-websites/north-stockton-railroad-bridge/>. Accessed: September 20, 2011.

Kessler Consulting, Inc. 2009. Pinellas County Florida: MRFing Our Way to Diversion: Capturing the Commercial Waste Stream. Materials Recovery Facility Feasibility Study. Available: <http://www.dep.state.fl.us/waste/quick_topics/publications/shw/recycling/InnovativeGrants/IGYear9/finalreport/Pinellas_IG8-06_MRF_Feasibility_Study.pdf> Accessed: July 2011.

McPherson, E.G. Simpson, J.R. Peper, P.J. Xiao Q. 1999. Tree Guidelines for San Joaquin Valley Communities. Prepared by the Western Center for Urban Forest Research and Education, and the USDA Forest Service, Pacific Southwest Research Station.

NEED Project. 2011. Energy Consumption. Available: <http://www.need.org/needpdf/infobook_activities/SecInfo/ConsS.pdf>. Accessed: August 17, 2011.

Nelson Nygaard. 2011. City of Stockton Climate Action Plan—Transit Plan/Program. August 2.

NYSERDA. no date. NYSERDA LED Traffic Signal Analyzer Basic Tool. NYSERDA LED Traffic Signal Analyzer: Inputs and Assumptions. Available: www.lrc.rpi.edu/ltgtrans/nysled

Pacific Gas & Electric Company (PG&E). 2009. Application Assessment of Bi-Level LED Parking Lot Lighting. Host Site: Raley's Supermarket, West Sacramento, California. Final Report prepared in support of the U.S. Department of Energy Solid State Lighting Technology Demonstration GATEWAY Program.

Pacific Gas and Electric Company (PG&E). 2011a. Appliance Rebates. Available: <http://www.pge.com/myhome/saveenergymoney/rebates/appliance/>. Accessed: July 6, 2011.

Pacific Gas and Electric Company (PG&E). 2011b. Save Energy & Money. Retrocommissioning (RCx) Program. Available: <http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/retrocommissioning/>. Accessed: July 6, 2011.

Pacific Gas and Electric Company (PG&E). 2011c. Company Info, Gas Rates. Available: <http://www.pge.com/nots/rates/tariffs/rateinfo.shtml>. Accessed: August 20, 2011.

Pacific Gas and Electric Company (PG&E). 2011d. Boilers and Water Heating Rebate Catalog. Available: <http://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/boilers_waterheating_catalog_final.pdf>. Accessed: August 20, 2011.

Pacific Northwest National Laboratory (PNNL). 2010. Demonstration Assessment of Light-Emitting Diode (LED) Roadway Lighting on Residential and Commercial Streets. Host Site: Palo Alto, California. Final Report prepared in support of the US DOE Solid-State Lighting Technology Demonstration GATEWAY Program.

Peterson, G. 2011. Incandescent-to-LED-Relamping Energy Cost Savings Calculation. Available: <http://dl.ledtronics.com/pdf/led_energy_savings_34.pdf>

Repa, E. W. 2005. NSWMA's 2005 Tip Fee Survey. NSWMA Research Bulletin 05-3. Available: <http://www.environmentalistseveryday.org/docs/Tipping-Fee-Bulletin-2005.pdf>. Accessed: July 2011.

RLW Analytics. 2005. SMUD Residential Lighting and Appliance Efficiency Saturation Study. Prepared for the Sacramento Municipal Utility District. December 7.

Sacramento Municipal Utility District (SMUD). 2011. Solar FAQs. Available: <http://www.smud.org/en/community-environment/solar/Pages/solarFAQs.aspx >. Accessed: September 20, 2011.

San Joaquin Regional Transit District (SJRTD). 2011. Fares Metro, Intercity, Hopper. Available: <http://sanjoaquinrtd.com/maps_and_schedules/fares.php>. Accessed: August 20, 2011.

Sperling, Daniel and Sonia Yen. 2009. Low Carbon Fuel Standards. Winter.

Transportation Authority of Marin. 2006. Marin County Safe Routes to Schools. Program Evaluation and Recommendations 2005–2006. Available: <http://www.tam.ca.gov/Modules/ShowDocument.aspx?documentid=358>. Accessed: July 7, 2011.

Transportation Research Board (TRB). 2005. Transit Cooperative Research Program (TCRP) Report 95: Traveler Response to Transportation System Changes Handbook. Chapter 13: Parking Prices and Fees. Available: <http://www.trb.org/Publications/Blurbs/162432.aspx>

U.S. Census. n.d. Median and Average Square Feet of Floor Area in New Single-Family Houses Completed by Location. Available: <http://www.census.gov/const/C25Ann/sftotalmedavgsqft.pdf>. Accessed: June 6, 2011.

U.S. Census Bureau. 2005. 2005 American Communities Survey. Available: <http://factfinder.census.gov/servlet/ADPGeoSearchByListServlet?ds_name=ACS_2005_EST_G00_&_lang=en&_ts=322657528706>. Accessed: May 5, 2011.

U.S. Census Bureau. 2011a. Characteristics of New Housing for 2010. Number of Bathrooms in New Single-Family Houses Completed. Available: <http://www.census.gov/const/C25Ann/sftotalbaths.pdf>. Accessed: Accessed: August 20, 2011.

U.S. Census Bureau. 2011b. Characteristics of New Housing for 2010. Number of Multifamily Units Completed by Number of Bathrooms per Unit. Available: <http://www.census.gov/const/C25Ann/mfubathsall.pdf>. Accessed: August 20, 2011.

U.S. Census Bureau. 2011c. Characteristics of New Housing for 2010. Median and Average Square Feet of Floor Area in New Single-Family Houses Completed by Location. Available: <http://www.census.gov/const/C25Ann/sftotalmedavgsqft.pdf>. Accessed: August 20, 2011.

U.S. Census Bureau. 2011d. Characteristics of New Housing for 2010. Median and Average Square Feet of Floor Area in Units in New Multifamily Buildings Completed. Available: <http://www.census.gov/const/C25Ann/mfu_medavgsqft.pdf>. Accessed: August 20, 2011.

U.S. Congress. 1992. Energy Policy Act of 1992. 102nd Congress. 2nd Session. H.R.776.ENR. Available: <http://thomas.loc.gov/cgi-bin/query/z?c102:H.R.776.ENR>. Accessed: May 16, 2005.

U.S. Department of Energy (DOE). 2004. NREL. State Energy Program Case Studies: California Says "Go" To energy-Saving Traffic Lights. Available: <http://www.nrel.gov/docs/fy04osti/35551.pdf>. Accessed: August 20, 2011.

U.S. Department of Energy (DOE).. 2010. National Retail REC Products. Available: <http://apps3.eere.energy.gov/greenpower/buying/buying_power.shtml?state=CA>. Accessed: July 6, 2011

U.S. Department of Energy (DOE). 2011a. Home Energy Saver. Available: <http://hes.lbl.gov/consumer>. Accessed: July 6, 2011.

U.S. Environmental Protection Agency (EPA). 2009a. Potential for Reducing Greenhouse Gas Emissions in the Construction Sector. February.

U.S. Environmental Protection Agency (EPA). 2009b. Renewable Portfolio Standards Fact Sheet. Last Revised: April 2009. Available: <http://www.epa.gov/chp/state-policy/renewable_fs.html>. Accessed: July 6, 2011.

U.S. Environmental Protection Agency (EPA). 2010a. Emissions & Generation Resource Integrated Database (eGRID). Version 1.1. Available: <http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html>. Accessed: June 3, 2010.

U.S. Environmental Protection Agency (EPA). 2010b. Energy Star Residential Appliances, Savings Calculators. Available: <http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing#res_app>. Accessed: August 24, 2011.

U.S. Environmental Protection Agency (EPA). 2010c. Combined Heat and Power Partnership, CHP Emissions Calculator. Available: <http://www.epa.gov/chp/basic/calculator.html> Accessed: July 6, 2011.

U.S. Environmental Protection Agency (EPA). 2010d. 2009 Annual Report. Responsible Appliance Disposal Program.

U.S. Environmental Protection Agency (EPA). 2010e. Reducing Urban Heat Islands: Compendium of Strategies. Green Roofs. Available at: <http://www.epa.gov/heatisland/resources/pdf/GreenRoofsCompendium.pdf>. Accessed: August 24, 2011.

U.S. Environmental Protection Agency (EPA). 2011. ENERGY STAR: Why Choose ENERGY STAR Qualified LED Lighting? Available: <http://www.energystar.gov/index.cfm?c=ssl.pr_why_es_res>. Accessed: March 16, 2011>. Accessed: August 24, 2011.

U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE). 2011. Energy Savings Calculators. Available: <www.energystar.gov>. Accessed: August 10, 2011.

Western Pacific Signal, LLC. 2011. Estimate. LED Signal . San Leandro, CA.

Personal Communication

Maziar, S. Project Manager, Buildings and Appliance Office. California Energy Commission. December 2008—email correspondence with Aaron Burdick, ICF International.

Meissner, Gregg. City of Stockton, Stockton, CA. November 2011. Personal communication with Rich Walter, ICF International.

Morales, Kindelberg. Administrative Analyst II. City of Stockton, Stockton, CA. December 2010. Email message to Laura Yoon, ICF International.

Parlin, Larry. Municipal Utilities District. City of Stockton, Stockton CA. June 1, 2011. Telephone conversation with Laura Yoon, ICF International.

Price, Melissa. Municipal Utilities District. City of Stockton, Stockton CA. April 29, 2011. Email message to David Stagnaro forward to Laura Yoon, ICF International.

Stagnaro, David. Planning Manager. City of Stockton, Stockton, CA. April 29, 2011 and May 3, 2011. Email messages to Laura Yoon, ICF International.

Tellez, Kathrin. Associate. Fehr & Peers, Walnut Creek, CA. June 2, 2011. Email message to Laura Yoon, ICF International.

Attachment C-1

Fehr & Peers Transportation Memo—November 21, 2011

FEHR PEERS

MEMORANDUM

Date: November 21, 2011

To: Laura Yoon, ICF

From: Mackenzie Watten and Kathrin Tellez, Fehr & Peers

Subject: ***City of Stockton Climate Action Plan (CAP) Implementation, Effect on Vehicle Travel***

WC10-2776

This memorandum documents the potential reduction in vehicle miles of travel (VMT) that are expected to occur by 2020 with implementation of the proposed City of Stockton Climate Action Plan (CAP). VMT is an important metric related to greenhouse gas emissions coming from transportation sources since the amount of emissions is directly related to the number of miles traveled by vehicles on the City's roads. Existing and projected future conditions under the future Business as Usual (BAU) scenario were documented in our memorandum dated May 10, 2011. The CAP scenario assumes implementation of the plans and policies included in the CAP, including the *Transit Plan* prepared by Nelson\Nygaard and the *Multi-Modal Street Design Guidelines* prepared by Fehr & Peers.

SUMMARY OF CONCLUSIONS

The total VMT generated by residents and employees of Stockton businesses is expected to increase by the year 2020 as new housing units are developed and new jobs are created, with total VMT increasing by approximately 10 percent. Because employment growth is expected to outpace household growth over the life of the CAP, providing additional opportunities for Stockton residents to work in Stockton, VMT per capita (where "capita" includes both residents and employees) is expected to decrease by approximately 3 percent under the 2020 BAU scenario as compared to the base year.

As compared to the 2020 BAU scenario, the CAP transportation measures would reduce overall daily VMT and VMT per capita by approximately 150,000 miles (or 3.0 percent). As compared to the Base Year, CAP implementation would reduce VMT per capita by approximately 5.2 percent.

MODELING PROCEDURE

The Base Year (2005) and Business as Usual (2020 BAU) modeling procedures were documented in the May 10, 2011 memorandum. Modifications to the model to reflect the CAP scenario include incorporation of the 4Ds and potential land use modifications associated with the CAP.

The literature on travel behavior clearly indicates that the several "D" variables (land use Density, land use Diversity, pedestrian Design, and access to regional Destinations) have a significant effect on travel demand. To quantify the effects of the "D" CAP strategies, the model output was adjusted to more accurately reflect the benefits of smart growth development. For the Stockton CAP, the adjustment process reduces the number of vehicle trips (and associated VMT) based on a set of elasticities that relate changes in vehicle trips to changes in the 4D inputs.

The residential population and the number of jobs assumed in each scenario are summarized in **Table 1**. In addition to the 4Ds adjustments, the CAP strategy of increased density was also evaluated assuming more infill residential development in the Downtown Area and less development on the fringe of the City. Thus, while the total citywide population and employment numbers are the same between the BAU and CAP scenarios, the physical location of the dwelling units will differ.

TABLE 1
STOCKTON POPULATION SUMMARY

Scenario	Population	Employment
2005 Baseline	279,468	119,027
2020 BAU	306,729	147,063
2020 CAP	306,729	147,063

Source: City of Stockton Travel Demand Model, City of Stockton and Fehr & Peers.

VMT CALCULATIONS

Stockton's greenhouse gas inventory attempts to capture all of the GHG emissions generated by land uses within Stockton. For transportation purposes, it is important to define the total amount of VMT generated by Stockton. For this analysis, the Stockton VMT will include:

a) all of the VMT associated with trips made completely internally within Stockton;

b) half of the VMT generated by jobs and residences located within Stockton that require travel to/from external destinations (this is consistent with the recent SB 375 Regional Targets Advisory Committee (RTAC) guidance that the two generators of an inter-jurisdictional trip should each be assigned half of the responsibility for the trip and its VMT); and

c) none of the responsibility for vehicles passing completely through the City with neither an origin nor a destination within the City (also consistent with RTAC guidance).

This means that Stockton will be responsible for some VMT occurring outside of its borders, particularly for longer-distance commute trips. On the other hand, Stockton will not be responsible for some VMT occurring inside its borders, particularly the VMT caused by through travel.

CLIMATE ACTION PLAN VMT CALCULATIONS

The City's model was modified to quantify the VMT implications of Density, Diversity, Design and Destinations associated with the CAP and raw VMT estimates were produced. The raw model results, which include total tips and trip length by purpose, were then reviewed and adjusted based on the CAP strategies developed by the Project team.

Discussion with the project team targeted transportation measures under each strategy that could be fully in place by 2020. These measures were then grouped into categories that are both quantifiable and mutually dependent. Additional details on the VMT reductions for each category, and data sources for the resulting VMT reduction estimates, can be found in **Attachment 1.**

Some of the measures were quantified using the City's travel demand model. Other measures were quantified using published documents and research, such as information presented in the publication *Growing Cooler* from the Urban Land Institute, the publication from the California Air Pollution Control Officers Association (CAPCOA), *Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures*, August 2010, and projected increases in non-motorized travel documented in the City of Stockton Bike Plan. The trip reduction source/analysis method is also noted in Attachment 1. The resulting total VMT and VMT per capita with implementation of the CAP is shown in **Table 2** and compared to the BAU and Base Year conditions.

TABLE 2
STOCKTON VMT CALCULATIONS

Scenario	Households	Population	Employment	Daily VMT	VMT / HH	VMT per Capita (Pop + Emp)
2005	93,156	279,468	119,027	5,709,038	61.3	14.3
2020 BAU	102,243	306,729	147,063	6,308,026	61.7	14.0
2020 CAP	102,243	306,729	147,063	6,161,027	60.3	13.6

Note: Household, population and employment based on model land uses.
Source: Fehr & Peers.

The total VMT generated by residents and employees of Stockton business are expected to increase as new housing units are developed and new jobs are created through 2020, with total VMT expected to increase by approximately 10 percent under the BAU scenario as compared to the Base Year. The CAP transportation measures reduce overall daily VMT by 146,999 miles (2.3 percent reduction), as compared to the 2020 BAU scenario, and reduce VMT per capita by 3.0 percent.

VMT per capita with CAP implementation is expected to decrease by approximately 5.2 percent as compared to the Base Year, although total VMT is projected to increase. The contribution to VMT reductions from each major strategy is presented in **Table 3**. Some measures are not directly expected to reduce VMT, although they are expected to reduce greenhouse gases by making the transportation system more efficient, such as Intelligent Transportation System (ITS) projects that allow for more even traffic flow along regional corridors. Additional GHG reductions are also expected through the changing vehicle fleet that will achieve better fuel economy in the future.

TABLE 3
SUMMARY OF VMT REDUCTIONS WITH CAP MEASURES

Measure	Potential VMT Reduction per day in 2020
Trans-1: Land Use/Transportation System Design Integration	15,326
Trans-2: Parking	16,570
Trans-3: Transit System Support	13,532
Trans-4: Goods Movement	10,251
Trans-5: Reduce Barriers for Non-Motorized Travel	15,520
Trans-6: Transit System	0
Trans-7: Safe Routes to School	21,132
Trans-8: Additional Safe Routes to School and TDM	54,668
TOTAL	146,999

Source: Fehr & Peers.

Additional reductions in VMT could occur if fuel prices significantly rise above historic levels or if the gas tax is increased; however, the City has minimal influence over fuel prices and taxes and it is challenging to predict how those might change in the future. Additionally, it should be noted that many of the CAP measures would only be implemented as new developments occur and no transportation measures are mandatory for existing residents. Many CAP measures strive to encourage behavior, or modify City codes in such a way to facilitate a lifestyle with less driving. Additional VMT reductions could occur with implementation of mandatory measures, but it is not likely that those measures would be implemented during the life of this plan.

RISING FUEL PRICES

The traffic model used to project Stockton's future vehicle miles traveled (VMT) does not take into account potential changes in fuel prices. Although the direct relationship between fuel prices and travel behavior is difficult to quantify with precision, there have been a number of studies over the last three decades, based on data from California and other parts of the United States, that have quantified short (less than one year), medium (1 to 5 years) and long-term (5+ years) fuel price elasticities ranging from -0.02 to -0.30. This means that with a 100 percent increase in the real cost of fuel (accounting for inflation), VMT is expected to decrease between 2 to 30 percent. There are numerous other societal factors that play a role in changing travel behavior, such as the availability of affordable housing in a jobs-rich area, the availability of alternative travel options, such as convenient transit or safe bicycle/walking facilities, and the purchase of more fuel efficient vehicles.

For the purposes of this analysis, a VMT/fuel price elasticity of -0.10 was selected for use. Other measures that are expected to result in a decrease in VMT have already been accounted for, such as improvements to the non-motorized transportation system, and potential expansions of transit service. It should be noted that the strategies presented in Table 4 are provided for informational purposes and that these strategies have not been included in the CAP.

FEHR PEERS

TABLE 4
POTENTIAL VMT REDUCTION FROM OTHER MEASURES

Strategy	Discussion	Potential Daily VMT Reduction
Fuel Price Increase	Assuming elasticity of -0.10, a 100 percent increase in fuel price would lead to a 10 percent decrease in VMT	594,611

Source: Fehr & Peers.

This completes our assessment of the VMT reductions that are likely to occur with implementation of the City of Stockton CAP. Please call Kathrin or Mackenzie with any questions.

ATTACHMENT 1 – DETAILED STRATEGY INFORMATION

The following provides additional information related to the VMT reduction calculations within the major transportation strategy categories.

Trans-1 – Land Use/Transportation System Design Integration

Numerous elements of the built environment have an effect on travel behavior, including density, floor-area-ratio (FAR), housing type balance, allowable land uses, and the integration of residential and non-residential uses. These elements relate to the four "Ds" of Smart Growth planning: density, diversity, design, and destinations. Research has found there to be a link between the Ds and travel behavior; when destinations are close together – due to density – people are more likely to take modes other than private vehicles. Likewise, positive pedestrian design leads to fewer vehicle trips as mixed use development has the potential to reduce vehicle trips and vehicle usage by providing adjacent services that can be accessed by walking. For example, an office development with a nearby restaurant can reduce or eliminate the need to drive to lunch.

Potential vehicle trip and vehicle miles of travel (VMT) reductions are detailed in the publication from the California Air Pollution Control Officers Association (CAPCOA), *Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures*, August 2010, which is a compilation of numerous data sources including the Urban Land Institute (ULI) publication *Growing Cooler (2008),* and nationwide and statewide data summarized by EPA.

The research indicates that increases in density can reduce VMT by up to 30 percent, increasing location efficiency within a region, such as infill development in a downtown area, can reduce VMT by up to 65 percent, increasing the diversity of land uses can reduce VMT by up to 30 percent, and increasing destination accessibility can reduce VMT by up to 20 percent. The reductions typically apply to new development; however, providing increased local shopping opportunities within an established neighborhood can alter the travel behavior of existing residents.

Documented elasticities were incorporated in the Stockton travel demand model to account for the Ds. For the CAP scenario, density was increased in the built-out area of the City – primarily north of Charter Way, east of Pershing Avenue, south of Harding Way, and west of Wilson Way. This was accomplished by assuming development of 300 multi-family homes in the greater downtown area TAZ's. In addition, a balance of jobs and housing in all new village areas and throughout the City were prioritized. This included encouraging a diversity of uses to be provided to minimize the need for vehicle travel for basic needs.

Overall, the reductions associated with integration of the land use and transportation system design are expected to decrease VMT by approximately 15,326 daily miles, (comprised of 9690 VMT reduction attributable to density measures and 5,636 for diversity measures). Design elements are evaluated in Trans-6. Destination measures are already accounted for in the model and no further reductions were taken.

Trans S-1 – Intelligent Transportation Systems

Technological improvements to upgrade signal systems to provide adaptive control, synchronization, and transit priority, changeable message signs to alert drivers to unique conditions; and incorporation of next bus technology at transit stops have been proven to smooth out traffic flows and reduce driver/transit passenger frustration. Such measures are intended to allow traffic to move at more stable and consistent speeds, which can have a beneficial effect on

the emissions caused by those vehicles. However, such measures do not typically cause substantial reductions in VMT, so they have not been included in these calculations.

Trans 2 – Parking

Parking attributes – such as price, location, and availability – can influence parking behavior. Some people are willing to walk longer distances to get free parking, while others may choose to ride transit in an area with high parking prices and limited parking availability. Likewise, employees may opt to take transit instead of driving if they can receive financial incentives for doing so. Most of the parking supply within the City of Stockton, outside of the downtown area, is free. Working within the constraints of the City, we have developed a set of strategies that can reduce vehicle trips by making adjustments to existing parking supply and future parking development. Strategies include designating the most attractive spots for rideshare vehicles, offering incentives for employees not to park, and adjusting parking requirements for new development in transit-heavy areas.

A variety of sources were reviewed to calculate potential VMT reductions associated with parking strategies, including a City of Sacramento study that calculated trip reduction for preferred parking based on nearby amenities, with an associated decline in vehicle trips ranging from 5-10 percent. The *Travelers Response to Transportation System Changes* developed by the Transportation Cooperative Research Program (TCRP) indicates that charging more for parking, or providing parking "cashout," can reduce VMT per employee by 12 percent. These reductions apply only to commute trips.

For this measure, increasing parking costs by 10 percent in the downtown area, and reducing parking requirements for new development by 20 percent in the downtown outside of the central parking district and 10 percent elsewhere in the city, are expected to decrease VMT by 14,302 in the downtown area, and by 2,268 in the remainder of the city, for a total VMT reduction of 16,570. Increases in parking costs would affect all trips to the downtown, while changes in parking requirements would only affect new developments and trips generated by those developments.

Trans 3 – Transit System Support

Although the City of Stockton is not a transit provider, the City can encourage and require new developments to provide transit amenities within the Project area including the potential for bus stop amenities, transit signal priority at intersections; or requiring that all new residences be located within a half-mile walk of an existing or planned transit route.

Based on information in California Air Pollution Control Officers Association (CAPCOA), *Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures*, August 2010 and National Household Travel Surveys, 2001 http://www.dot.ca.gov/hq/tsip/ tab/documents/travelsurveys/ Final2001_StwTravelSurvey WkdayRpt.pdf, p.150 (Suburban – SCAG, SANDAG, Fresno County), provision of transit support facilities, such as bus shelters, is expected to result in a daily VMT reduction of 1,438.

Expanding the park and ride system could result in up to 0.5 percent reduction in commute trips based on data from Washington State Department of Transportation, *Cost Effectiveness of Park-and-Ride Lots in the Puget Sound Area.* http://www.wsdot.wa.gov/research/reports/fullreports/094.1.pdf, which would translate into a VMT reduction of 12,093. This reduction correlates to the provision of approximately 200 new park and ride spaces, which is consistent with the needs for the City of Stockton identified in the San Joaquin Council of Governments (SJCOG) *Park-and-Ride Lot Master Plan (2007)*.

Trans 4 – Goods Movement

There are a number of at-grade railroad crossings throughout the City of Stockton, including those on Eight Mile Road and Lower Sacramento Road. These at-grade crossings contribute to vehicle delay, especially when long freight trains pass through the crossings. Longer freight trains have been observed to block intersections in Stockton for significant periods of time, increasing vehicle idling and in some instances creating congestion and circuitous travel on alternate routes that avoid the crossing. Providing grade-separated crossings where rail lines and roadways intersect can reduce idling and traffic diversions. Two grade separated crossings on Eight Mile Road and one grade separated crossing on Lower Sacramento Road are currently under construction. In addition, a grade separated crossing is planned on Sperry Road. Based on a study conducted by the City of Irvine, it is expected that VMT could be reduced by up to 10,251 miles.

Grade separations on Airport Way and French Camp Road are planned to be constructed when these roadways are widened to accommodate approved and pending projects in the area, although there is currently no schedule for their construction; should these improvements be constructed over the life of the CAP, additional VMT reductions could be realized.

Trans 5 – Reduce Barriers for Non-Motorized Travel

Cycling is a non-emissions forming mode of transportation that has a high potential for success in Stockton. By implementing the City's adopted Bicycle Master Plan, existing gaps in the network can be filled. Beyond this, providing facilities for bicycle commuters – such as showers and bicycle lockers – can encourage them to use this mode for short and medium-length trips.

In 2007, the City of Stockton completed a Bicycle Master Plan which identified existing bicycle routes, bicycle usage, and future improvements to the bicycle system. This report also identified several major gaps in the City's bicycle network including the need for additional connections to major destinations. It is anticipated that the addition of these bicycle facilities will encourage additional bicycle commuting, as well as bicycling for other trip purposes, such as for shopping or personal business. According to this study, approximately 0.5 percent of commuters travel to work via bicycle; however, 13 percent of Stockton residents have a driving commute of 10 minutes or less, indicating that at least some of these commutes could potentially occur via an alternative mode, such as bicycling, if facilities were provided.

One method that can be used to estimate the increase in bicycle commuting is provided in a publication entitled *If You Build Them, Commuters Will Use Them; Cross-Sectional Analysis of Commuters and Bicycle Facilities* (Transportation Research Board Record 1578, 1997). This report estimated an increase of bicycle commuting of 0.075 percent per mile of bikeway added for each 100,000 residents. Based on the historical and projected rate of constriction of new bicycle facilities, it is expected that approximately 2 miles per year of new bicycle facilities would be constructed over the life of the CAP.

Using the above methodology, the City's bicycle commuting share is anticipated to increase by approximately 6 percent. Implementation of other bicycle supportive polices would also contribute to the potential that short trips within Stockton could occur via bicycle and it is likely that non-commute trips would increase as well.

One impediment to bicycle commuters is that there is often no specified place to store or park bicycles. Another impediment is that bicyclists often are unable to shower and change after riding to work and therefore may be disinclined to commute using bicycles. One method to address these disincentives is to require new developments to provide bicycle lockers and showers on site. This can be accomplished by adding requirements to the City's Zoning Code. These requirements are consistent with Rule 9410, Employer Trip Reduction, of the San Joaquin Valley Air Pollution Control District.

The "How to Reduce the Number of Short Trips By Car" study noted that enacting policies to provide additional bicycle facilities should reduce automobile trips by 5-10 percent. This is supported by a 2008 US EPA study. We assume that the reduction in vehicle trips for the provision bicycle lockers and showers alone would be 1 percent. However, this reduction would be further reduced because these reductions would only apply to new development and would only apply to commute trips.

In addition to measures identified by the Bicycle Master Plan, the CAP assumes implementation of *Multi-Modal Street Design Guidelines* as prepared by Fehr & Peers and the reduction of physical barriers to bicycle and pedestrian networks at freeways, railroads, cul-de-sacs, and connections to transit stops.

Overall the provision of additional bicycle and pedestrian facilities and implementation of the multi-modal street design guidelines is expected to reduce daily VMT by 15,520.

Trans 6 – Transit System (Operated by Others)

The San Joaquin Regional Transit District (SJRTD) is the primary transit provider in the City of Stockton. A Transit Plan was developed as part of the CAP and identified service improvements and enhancements that could be implemented over the life of the CAP to increase ridership. Strategies include provision of additional BRT routes, realignment of existing and planned routes, and increasing service in terms of frequency and geography. An increase in ridership from approximately 3 percent to 5 percent mode share is a desired outcome of the transit plan. However, no funding mechanism to provide the increased level of service is identified. It thus expected to that not all of the Transit Plan recommendations will be implemented. It is assumed that the Transit Plan recommendations that are implemented will keep transit mode share at existing levels (3 percent). As transit mode share is expected to remain the same relative to existing and the BAU case, no reduction in VMT is associated with the CAP.

Trans 7 – Safe Routes to School

Since the 1960s, the percentage of school-aged children walking or bicycling to school has decreased from 42 percent to 16 percent. Reasons for this drop have included an increase in distance to schools, traffic-related safety concerns, concerns about crime, and conflicting school policies. To address this issue and promote walking and cycling to school, Safe Routes to School funding programs have been established at the State and Federal levels. Cities can apply for grants for engineering, education, enforcement and encouragement programs to increase walking and cycling trips to school. Individual projects can include the enhancement of pedestrian crossings, encouragement activities such as a walking school bus, and educational programs including teaching students bicycle safety.

Historically, students traveled to school by a variety of means, including walking or biking when the school was located proximate to their house, or riding a school bus when the school was too far away to reach by walking or bicycling. Over time, the usage of these other travel modes has declined as more parents elected to drive their children for a variety of reasons. As a reaction to this increased automotive usage, cities began developing Safe Routes to School Programs to encourage the use of other travel modes for students. Both the State and Federal Government provide funding for Sate Routes to Schools.

There is one empirical study conducted by Marin County which estimated travel mode shifts related to the implementation of a Safe Routes to School program. This study (*Safe Routes to School Program Evaluation*, August 2004) determined that the implementation of this program reduced single-occupant automobile usage by 13 percent at schools based on surveys. Based on this result, we have conservatively estimated a VMT reduction of 10 percent as applied to school trips. However, this program has a very limited application as the percentage of overall trips and VMT is approximately 2. Therefore, the anticipated reduction in overall Citywide VMT is 21,132.

Trans 8 – Additional Safe Routes to School and other travel demand management (TDM)

The VMT reductions that are expected to result with implementation of the CAP mostly apply to new land use development proposed within the City and the potential for slight modifications to existing resident travel behavior. There are, however, additional modifications to travel behavior that the average citizen can undertake that could result in large VMT reductions. Small changes to daily travel routines, such as walking children to school one day a week, working from home one day a month and/or using an alternative mode of transportation, such as biking, transit or carpooling, to work one day at month could result in significant reductions should a large enough proportion of the population alter their travel behavior.

This measure includes the VMT reduction that would occur from an additional 10 percent of K-12 students walking/biking to school instead of driven to, a one percent participation in voluntary TDM for Stockton residents employed in Stockton, a one percent participation in voluntary TDM for those who live in Stockton and work outside of Stockton but within San Joaquin County or those who live in San Joaquin County outside Stockton but work in Stockton, and a one percent participation in voluntary TDM for those who live in Stockton but work outside San Joaquin County or live outside San Joaquin County and work in Stockton. The estimated reduction of these combined measures in VMT is 54,668.

Attachment C-2

Fehr & Peers Transportation Memo—August 3, 2011

FEHR PEERS

MEMORANDUM

Date: August 3, 2011

To: Laura Yoon, ICF

From: Mackenzie Watten and Kathrin Tellez, Fehr & Peers

Subject: ***City of Stockton Climate Action Plan (CAP) Implementation, Effect on Vehicle Travel***

WC10-2776

This memorandum documents the potential reduction in vehicle miles of travel (VMT) that are expected to occur by 2020 with implementation of the proposed City of Stockton Climate Action Plan (CAP). VMT is an important metric related to greenhouse gas emissions coming from transportation sources, since the amount of emissions is directly related to the number of miles traveled by vehicles on the City's roads. Existing and projected future conditions under the future Business as Usual (BAU) scenario were documented in our memorandum dated May 10, 2011. The CAP scenario assumes implementation of the plans and policies included in the CAP, including the *Transit Plan* prepared by Nelson\Nygaard and the *Multi-Modal Street Design Guidelines* prepared by Fehr & Peers.

SUMMARY OF CONCLUSIONS

The total VMT generated by residents and employees of Stockton businesses is expected to increase by the year 2020 as new housing units are developed and new jobs are created, with total VMT increasing by approximately 10 percent. Because employment growth is expected to outpace household growth over the life of the CAP, providing additional opportunities for Stockton residents to work in Stockton, VMT per capita (where "capita" includes both residents and employees) is expected to decrease by approximately 3 percent under the 2020 BAU scenario as compared to the base year.

As compared to the 2020 BAU scenario, the CAP transportation measures would reduce overall daily VMT and VMT per capita by approximately 362,000 miles (or 6 percent). As compared to the Base Year, CAP implementation would reduce VMT per capita by approximately 9 percent.

MODELING PROCEDURE

The Base Year (2005) and Business as Usual (2020 BAU) modeling procedures were documented in the May 10, 2011 memorandum. Modifications to the model to reflect the CAP scenario include incorporation of the 4Ds and potential land use modifications associated with the CAP.

The literature on travel behavior clearly indicates that the several "D" variables (land use Density, land use Diversity, pedestrian Design, and access to regional Destinations) have a significant effect on travel demand. To quantify the effects of the "D" CAP strategies, the model output was adjusted to more accurately reflect the benefits of smart growth development. For the Stockton CAP, the adjustment process reduces the number of vehicle trips (and associated VMT) based on a set of elasticities that relate changes in vehicle trips to changes in the 4D inputs.

The residential population and the number of jobs assumed in each scenario are summarized in **Table 1**. In addition to the 4Ds adjustments, the CAP strategy of increased density was also evaluated assuming more infill residential development in the Downtown Area and less development on the fringe of the City. Thus, while the total citywide population and employment numbers are the same between the BAU and CAP scenarios, the physical location of the new houses will differ.

TABLE 1
STOCKTON POPULATION SUMMARY

Scenario	Population	Employment
2005 Baseline	279,468	119,027
2020 BAU	306,729	147,063
2020 CAP	315,660	147,063

Source: City of Stockton Travel Demand Model, City of Stockton and Fehr & Peers.

VMT CALCULATIONS

Stockton's greenhouse gas inventory attempts to capture all of the GHG emissions generated by land uses within Stockton. For transportation purposes, it is important to define the total amount of VMT generated by Stockton. For this analysis, the Stockton VMT will include:

a) all of the VMT associated with trips made completely internally within Stockton;

b) half of the VMT generated by jobs and residences located within Stockton that require travel to/from external destinations (this is consistent with the recent SB 375 Regional Targets Advisory Committee (RTAC) guidance that the two generators of an inter-jurisdictional trip should each be assigned half of the responsibility for the trip and its VMT); and

c) none of the responsibility for vehicles passing completely through the City with neither an origin nor a destination within the City (also consistent with RTAC guidance).

This means that Stockton will be responsible for some VMT occurring outside of its borders, particularly for longer-distance commute trips. On the other hand, Stockton will not be responsible for some VMT occurring inside its borders, particularly the VMT caused by through travel.

CLIMATE ACTION PLAN VMT CALCULATIONS

The City's model was modified to quantify the VMT implications of Density, Diversity, Design and Destinations associated with the CAP and raw VMT estimates were produced. The raw model results, which include total tips and trip length by purpose, were then reviewed and adjusted based on the CAP strategies developed by the Project team.

Discussion with the project team targeted transportation measures under each strategy that could be fully in place by 2020. These measures were then grouped into categories that are both quantifiable and mutually dependent. Additional details on the VMT reductions for each category, and data sources for the resulting VMT reduction estimates, can be found in **Attachment 1.**

Some of the measures were quantified using the City's travel demand model. Other measures were quantified using published documents and research, such as information presented in the publication Growing Cooler from the Urban Land Institute, the publication from the California Air Pollution Control Officers Association (CAPCOA), *Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures*, August 2010, and projected increases in non-motorized travel documented in the City of Stockton Bike Plan. The trip reduction source/analysis method is also noted in Attachment 1. The resulting total VMT and VMT per capita with implementation of the CAP is shown in **Table 2** and compared to the BAU and Base Year conditions.

TABLE 2
STOCKTON VMT CALCULATIONS

Scenario	Households	Population	Employment	Daily VMT	VMT / HH	VMT per Capita (Pop + Emp)
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2020 BAU	102,243	306,729	147,063	6,308,026	61.7	13.9
2020 CAP	105,220	315,660	147,063	6,025,910	57.3	13.0

Note: Household, population and employment based on model land uses.
Source: Fehr & Peers.

The total VMT generated by residents and employees of Stockton business are expected to increase as new housing units are developed and new jobs are created through 2020, with total VMT expected to increase by approximately 10 percent under the BAU scenario as compared to the Base Year. The CAP transportation measures reduce overall daily VMT by 282,116miles (4.5 percent reduction), as compared to the 2020 BAU scenario, and reduce VMT per capita by 6.5 percent.

VMT per capita with CAP implementation is expected to decrease by approximately 9 percent as compared to the Base Year, although total VMT is projected to increase. The contribution to VMT reductions from each major strategy is presented in **Table 3**. Some measures are not directly expected to reduce VMT, although they are expected to reduce greenhouse gases by making the transportation system more efficient, such as Intelligent Transportation System (ITS) projects that allow for more even traffic flow along regional corridors. Additional GHG reductions are also expected through the changing vehicle fleet that will achieve better fuel economy in the future.

FEHR PEERS

TABLE 3
SUMMARY OF VMT REDUCTIONS WITH CAP MEASURES

Measure	Potential VMT Reduction per day in 2020
Trans-1: Land Use/Transportation System Design Integration	76,412
Trans-2: Parking	58,719
Trans-3: Transit System Support	39,167
Trans-4: Goods Movement	15,770
Trans-5: Reduce Barriers for Non-Motorized Travel	20,452
Trans-6: Transit System	50,464
Trans-7: Safe Routes to School	21,132
TOTAL	282,116

Source: Fehr & Peers.

Additional reductions in VMT could occur if fuel prices significantly rise above historic levels or if the gas tax is increased; however, the City has minimal influence over fuel prices and taxes and it is challenging to predict how those might change in the future. Additionally, it should be noted that many of the CAP measures would only be implemented as new developments occur and no transportation measures are mandatory for existing residents. Many CAP measures strive to encourage behavior, or modify City codes in such a way to facilitate a lifestyle with less driving. Additional VMT reductions could occur with implementation of mandatory measures, but it is not likely that those measures would be implemented during the life of this plan.

VOLUNTARY MEASURES

The VMT reductions that are expected to result with implementation of the CAP mostly apply to new land use development proposed within the City and the potential for slight modifications to existing resident travel behavior. There are, however, additional modifications to travel behavior that the average citizen can undertake that could result in large VMT reductions. Small changes to daily travel routines, such as walking children to school one day a week, working from home one day a month and/or using an alternative mode of transportation, such as biking, transit or carpooling, to work one day at month could result in significant reductions should a large enough proportion of the population alter their travel behavior. **Table 4** summarizes the potential VMT reductions from these and other voluntary measures.

RISING FUEL PRICES

The traffic model used to project Stockton's future vehicle miles traveled (VMT) does not take into account potential changes in fuel prices. Although the direct relationship between fuel prices and travel behavior is difficult to quantify with precision, there have been a number of studies over the last three decades, based on data from California and other parts of the United States, that have quantified short- (less than one year), medium- (1 to 5 years) and long-term (5+ years) fuel price elasticities ranging from -0.02 to -0.30. This means that with a 100 percent increase in the real cost of fuel (accounting for inflation), VMT is expected to decrease between 2 to 30 percent. There are numerous other societal factors that play a role in changing travel behavior, such as the availability of affordable housing in a jobs-rich area, the availability of alternative travel

options, such as convenient transit or safe bicycle/walking facilities, and the purchase of more fuel efficient vehicles.

For the purposes of this analysis, a VMT/fuel price elasticity of -0.10 was selected for use. Other measures that are expected to result in a decrease in VMT have already been accounted for, such as improvements to the non-motorized transportation system, and potential expansions of transit service. It should be noted that the strategies presented in Table 4 are provided for informational purposes and that these strategies have not been included in the CAP.

TABLE 4
POTENTIAL VMT REDUCTION FROM OTHER MEASURES

Strategy	Discussion	Potential Daily VMT Reduction
Safe Routes to School	For each additional 10 percent of K-12 students who walk/bike instead of being driven to/from school (in combination with the initial 10 percent already included in CAP)	21,132
Voluntary TDM – Stockton Residents Employed in Stockton	Each 1 percent participation by Stockton residents who shift to walking, biking, transit or a new carpool to their job in Stockton	9,350
Voluntary TDM – County Basis	Each 1 percent participation by residents of Stockton who commute to a job elsewhere in San Joaquin County, or residents elsewhere in San Joaquin County who commute to a job in Stockton who shift to walking, biking, transit or a new carpool	4,383
Voluntary TDM – Outside Region	Each 1 percent participation by residents of Stockton who commute to a job elsewhere outside San Joaquin County, or residents outside San Joaquin County who commute to a job in Stockton who shift to walking, biking, transit or a new carpool	19,803
Fuel Price Increase	Assuming elasticity of -0.10, a 100 percent increase in fuel price would lead to a 10 percent decrease in VMT	594,611

Source: Fehr & Peers.

This completes our assessment of the VMT reductions that are likely to occur with implementation of the City of Stockton CAP and presents information on the effectiveness of other voluntary strategies. Please call Kathrin or Mackenzie with any questions.

ATTACHMENT 1 – DETAILED STRATEGY INFORMATION

The following provides additional information related to the VMT reduction calculations within the major transportation strategy categories.

Trans-1 – Land Use/Transportation System Design Integration

Numerous elements of the built environment have an effect on travel behavior, including density, floor-area-ratio (FAR), housing type balance, allowable land uses, and the integration of residential and non-residential uses. These elements relate to the four "Ds" of Smart Growth planning: density, diversity, design, and destinations. Research has found there to be a link between the Ds and travel behavior; when destinations are close together – due to density – people are more likely to take modes other than private vehicles. Likewise, positive pedestrian design leads to fewer vehicle trips as mixed use development has the potential to reduce vehicle trips and vehicle usage by providing adjacent services that can be accessed by walking. For example, an office development with a nearby restaurant can reduce or eliminate the need to drive to lunch.

Potential vehicle trip and vehicle miles of travel (VMT) reductions are detailed in the publication from the California Air Pollution Control Officers Association (CAPCOA), *Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures*, August 2010, which is a compilation of numerous data sources including the Urban Land Institute (ULI) publication *Growing Cooler (2008),* and nationwide and statewide data summarized by EPA.

The research indicates that increases in density can reduce VMT by up to 30 percent, increasing location efficiency within a region, such as infill development in a downtown area, can reduce VMT by up to 65 percent, increasing the diversity of land uses can reduce VMT by up to 30 percent, and increasing destination accessibility can reduce VMT by up to 20 percent. The reductions typically apply to new development; however, providing increased local shopping opportunities within an established neighborhood can alter the travel behavior of existing residents.

Documented elasticities were incorporated in the Stockton travel demand model to account for the Ds. For the CAP scenario, density was increased in the built-out area of the City – primarily north of Charter Way, east of Pershing Avenue, south of Harding Way, and west of Wilson Way. This was accomplished by assuming development of 3,000 multi-family homes in the greater downtown area TAZ's that had low levels of land use diversity were also assumed to have a 10 percent increase in the diversity of land uses.

Overall, the reductions associated with integration of the land use and transportation system design are expected to decrease VMT by approximately 76,412 daily miles, (comprised of 67,492 VMT reduction attributable to density measures and 8,920 for diversity measures). Design elements are evaluated in Trans-6. Destination measures are already accounted for in the model and no further reductions were taken.

Trans S-1 – Intelligent Transportation Systems

Technological improvements to upgrade signal systems to provide adaptive control, synchronization, and transit priority, changeable message signs to alert drivers to unique conditions; and incorporation of next bus technology at transit stops have been proven to smooth out traffic flows and reduce driver/transit passenger frustration. Such measures are intended to allow traffic to move at more stable and consistent speeds, which can have a beneficial effect on the emissions caused by those vehicles. However, such measures do not typically cause substantial reductions in VMT, so they have not been included in these calculations.

Trans 2 – Parking

Parking attributes – such as price, location, and availability – can influence parking behavior. Some people are willing to walk longer distances to get free parking, while others may choose to ride transit in an area with high parking prices and limited parking availability. Likewise, employees may opt to take transit instead of driving if they can receive financial incentives for doing so. Most of the parking supply within the City of Stockton, outside of the downtown area, is free. Working within the constraints of the City, we have developed a set of strategies that can reduce vehicle trips by making adjustments to existing parking supply and future parking development. Strategies include designating the most attractive spots for rideshare vehicles, offering incentives for employees not to park, and adjusting parking requirements for new development in transit-heavy areas.

A variety of sources were reviewed to calculate potential VMT reductions associated with parking strategies, including a City of Sacramento study that calculated trip reduction for preferred parking based on nearby amenities, with an associated decline in vehicle trips ranging from 5-10 percent. The *Travelers Response to Transportation System Changes* developed by the Transportation Cooperative Research Program (TCRP) indicates that charging more for parking, or providing parking "cashout," can reduce VMT per employee by 12 percent. These reductions apply only to commute trips.

For this measure, increasing parking costs by 10 percent in the downtown area, and reducing parking requirements for new development by 20 percent in the downtown and 10 percent elsewhere in the city, are expected to decrease VMT by 27,179 in the downtown area, and by 31,540 in the remainder of the city, for a total VMT reduction of 58,719.

Trans 3 – Transit System Support

Although the City of Stockton is not a transit provider, the City can encourage and require new developments to provide transit amenities, such as: transit only lanes on roads through new development areas; transit signal priority at intersections; or requiring that all new residences be located within a half-mile walk of an existing or planned transit route.

Based on information in California Air Pollution Control Officers Association (CAPCOA), *Quantifying Greenhouse Gas Mitigation Measures: A Resource for Local Government to Assess Emission Reductions from Greenhouse Gas Mitigation Measures*, August 2010 and National Household Travel Surveys, 2001 http://www.dot.ca.gov/hq/tsip/ tab/documents/travelsurveys/ Final2001_StwTravelSurvey WkdayRpt.pdf, p.150 (Suburban – SCAG, SANDAG, Fresno County), provision of transit support facilities, such as transit only lanes and other amenities, is expected to result in a daily VMT reduction of 14,382. For this measure, provision of transit only lanes on half of new arterial roadways in the City was assumed. Requiring new employers of more than 100 employees to provide transit passes to employees would further reduce VMT by approximately 12,691.

Expanding the park and ride system could result in up to 0.5 percent reduction in commute trips based on data from Washington State Department of Transportation, *Cost Effectiveness of Park-and-Ride Lots in the Puget Sound Area. http://www.wsdot.wa.gov/research/reports/fullreports/094.1.pdf,* which would translate into a VMT reduction of 12,093. This reduction correlates to the provision of approximately 200 new park and ride spaces, which is consistent with the needs for the City of Stockton identified in the San Joaquin Council of Governments (SJCOG) *Park-and-Ride Lot Master Plan (2007)*.

Trans 4 – Goods Movement

There are a number of at-grade railroad crossings throughout the City of Stockton, including those on Eight Mile Road, Lower Sacramento Road, Airport Way, and French Camp Road. These at-grade crossings contribute to vehicle delay, especially when long freight trains pass

through the crossings. Longer freight trains have been observed to block intersections in Stockton for significant periods of time, increasing vehicle idling and in some instances creating congestion on alternate routes that avoid the crossing. Providing grade-separated crossings where rail lines and roadways intersect can reduce idling and traffic diversions. The City plans to construct grade-separated crossings on Eight Mile Road, Lower Sacramento Road, Airport Way, and French Camp Road. Two grade separated crossings on Eight Mile Road and one grade separated crossing on Lower Sacramento Road are currently under construction. Grade separations on Airport Way and French Camp Road are planned to be constructed when these roadways are widened to accommodate approved and pending projects in the area, although there is currently no schedule for their construction. Based on a study conducted by the City of Irvine, it is expected that VMT could be reduced by up to 0.25 percent, or 15,770 miles.

Trans 5 – Reduce Barriers for Non-Motorized Travel

Cycling is a non-emissions forming mode of transportation that has a high potential for success in Stockton. By implementing the City's adopted Bicycle Master Plan, existing gaps in the network can be filled. Beyond this, providing facilities for bicycle commuters – such as showers and bicycle lockers – can encourage them to use this mode for short and medium-length trips.

In 2007, the City of Stockton completed a Bicycle Master Plan which identified existing bicycle routes, bicycle usage, and future improvements to the bicycle system. This report also identified several major gaps in the City's bicycle network including the need for additional connections to major destinations. It is anticipated that the addition of these bicycle facilities will encourage additional bicycle commuting, as well as bicycling for other trip purposes, such as for shopping or personal business. According to this study, approximately 0.5 percent of commuters travel to work via bicycle; however, 13 percent of Stockton residents have a driving commute of 10 minutes or less, indicating that at least some of these commutes could potentially occur via an alternative mode, such as bicycling, if facilities were provided.

One method that can be used to estimate the increase in bicycle commuting is provided in a publication entitled *If You Build Them, Commuters Will Use Them; Cross-Sectional Analysis of Commuters and Bicycle Facilities* (Transportation Research Board Record 1578, 1997). This report estimated an increase of bicycle commuting of 0.075 percent per mile of bikeway added for each 100,000 residents. Based on our review of the City of Stockton Bicycle Master Plan and general plan, the City Goal is to construct 35 percent of the un-built bicycle network by 2016 and 65 percent by 2026, which includes 70 miles of new Class I, 67 miles of new Class II, and 167 miles of new Class III facilities, for a total of 304 new miles of bicycle facilities over the life of the Bicycle Plan. Of these totals, 81.1 miles have been identified as priority projects.

We anticipate that the City will complete the priority projects by 2020. Using the above methodology, the City's bicycle commuting share would increase by 17 percent, from approximately 0.5 percent to 0.6 percent. Implementation of other bicycle supportive polices would also contribute to the potential that short trips within Stockton could occur via bicycle and it is likely that non-commute trips would increase as well.

One impediment to bicycle commuters is that there is often no specified place to store or park bicycles. Another impediment is that bicyclists often are unable to shower and change after riding to work and therefore may be disinclined to commute using bicycles. One method to address these disincentives is to require new developments to provide bicycle lockers and showers on site. This can be accomplished by adding requirements to the City's Zoning Code. These requirements are consistent with Rule 9410, Employer Trip Reduction, of the San Joaquin Valley Air Pollution Control District.

The "How to Reduce the Number of Short Trips By Car" study noted that enacting policies to provide additional bicycle facilities should reduce automobile trips by 5-10 percent. This is supported by a 2008 US EPA study. We assume that the reduction in vehicle trips for the provision bicycle lockers and showers alone would be 1 percent. However, this reduction would

be further reduced because these reductions would only apply to new development and would only apply to commute trips.

Overall the provision of additional bicycle and pedestrian facilities and implementation of the multi-modal street design guidelines is expected to reduce daily VMT by 20,452.

Trans 6 – Transit System (Operated by Others)

The San Joaquin Regional Transit District (SJRTD) is the primary transit provider in the City of Stockton. A Transit Plan was developed as part of the CAP and identified service improvements and enhancements that could be implemented over the life of the CAP to increase ridership. Strategies include provision of additional BRT routes, realignment of existing and planned routes, and increasing service in terms of frequency and geography. An increase in ridership from approximately 3 percent to 5 percent mode share is a desired outcome of the transit plan. The net increase in transit ridership from implementation of the measures identified in the transit plan is expected to decrease daily VMT by approximately 50,464.

Trans 7 – Safe Routes to School

Since the 1960s, the percentage of school-aged children walking or bicycling to school has decreased from 42 percent to 16 percent. Reasons for this drop have included an increase in distance to schools, traffic-related safety concerns, concerns about crime, and conflicting school policies. To address this issue and promote walking and cycling to school, Safe Routes to School funding programs have been established at the State and Federal levels. Cities can apply for grants for engineering, education, enforcement and encouragement programs to increase walking and cycling trips to school. Individual projects can include the enhancement of pedestrian crossings, encouragement activities such as a walking school bus, and educational programs including teaching students bicycle safety.

Historically, students traveled to school by a variety of means, including walking or biking when the school was located proximate to their house, or riding a school bus when the school was too far away to reach by walking or bicycling. Over time, the usage of these other travel modes has declined as more parents elected to drive their children for a variety of reasons. As a reaction to this increased automotive usage, cities began developing Safe Routes to School Programs to encourage the use of other travel modes for students. Both the State and Federal Government provide funding for Sate Routes to Schools.

There is one empirical study conducted by Marin County which estimated travel mode shifts related to the implementation of a Safe Routes to School program. This study (*Sate Routes to School Program Evaluation*, August 2004) determined that the implementation of this program reduced single-occupant automobile usage by 13 percent at schools based on surveys. Based on this result, we have conservatively estimated a VMT reduction of 10 percent as applied to school trips. However, this program has a very limited application as the percentage of overall trips and VMT is approximately 2. Therefore, the anticipated reduction in overall Citywide VMT is 21,132.

Appendix D
Transit Plan



City of Stockton

Climate Action Plan – Transit Plan/Program

Updated August 2nd, 2011

Sub-consultant to ICF/Jones & Stokes

NELSON
NYGAARD

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The City of Stockton would like to thank and recognize the efforts of those involved in the development of the Stockton Transit Plan / Program. This includes the citizens of Stockton who participated in the Transit Plan / Program process and:

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Executive Summary

The City of Stockton is developing a Climate Action Plan (CAP) for reducing its Greenhouse Gas Emissions (GHG) to 15% below 2005 levels by the year 2020. Public transit, and transit supportive programs and policies, will play a role in this effort.

Nelson\Nygaard assisted the City in determining what actions are needed to:

- Improve the public transit network
- Eliminate potential last mile barriers that keep people from using transit
- Adopt transit supportive policies
- Identify long term funding solutions to support the existing and future transit system and transit-oriented-development

The final outcome of this effort is a comprehensive plan, with a program of specific actions and quantifiable measures, which the City can use to address issues in the CAP and assist the San Joaquin Regional Transit District (RTD) in identifying future policies/programs and related revenue sources to increase transit system utilization.

This document has eight sections:

1. Task Objectives and Outline
2. Summary of 2010 Transit Gap Analysis
3. Summary of 2009 RTD COA
4. Proposed improvements to the public transit network
5. Recommendations for car sharing (eliminating a last mile barrier) and Information Services
6. Recommended transit supportive policies
7. Funding Strategies
8. Action Plan

Summary of Transit Gap Analysis

This report was completed in early 2010 by city staff and the consulting firm TMD. The primary findings/recommendations were:

- The RTD's physical network coverage of the Stockton Metro Area is sufficient
- The RTD's span of service (days and hours of operation) is sufficient
- RTD should consider a number of "quality of service" improvements to attract new riders including:
    1. Increase frequency on key corridors
    2. Improve service reliability
    3. Improve the system's ease of use and streamline routes where appropriate
    4. Expand the Metro Express Bus Rapid Transit Program
    5. Implement New Service Standards

The Gap Analysis also included some recommendations for promoting transit supportive policies and funding.

RTD 2009 COA

This project (completed by TMD) focused on improving the network efficiency and service delivery for RTD services operating primarily within the Stockton Metro Area. The document included:

- An assessment of transit needs
- A review of existing services and the service framework
- A preferred service and fleet plan
- System finance information

The COA recommendations were divided into two implementation phases:

- Phase 1 was implemented in early 2011and included the introduction of RTD's second BRT service (Airport Corridor).
- Phase 2 improvements are targeted for 2013/14 but could be placed on hold depending upon RTD's level of success in obtaining additional capital and operating funds.

Proposed Transit Improvements

Peer Review

Nelson\Nygaard completed a peer review which compared some of RTD's performance metrics with similar systems in Modesto, Fresno and Bakersfield. In this brief assessment (not originally included in the scope of work) we learned that:

- RTD's low level of baseline service in the Stockton Metro Area (amount of service per capita and/or per square mile) puts transit at something of a disadvantage in addressing Greenhouse Gas Emissions.
- RTD's system is below the peer group in terms of service effectiveness (passengers served per hour of revenue service) and is above the peer group in terms of cost effectiveness (operating costs per revenue hour of service).

The Reality of Transit's Modal Share

One of the most important parts of this document is a "reality check" about how effective transit is likely to be in helping to reduce greenhouse gas emissions. Transit certainly has a role to play in creating a more livable community in Stockton and to some degree in can help in the effort to reduce GHG emissions. However, given the low current level of usage (ridership) and the low level of total service (baseline service levels), transit's current projected mode split of 3% is unlikely to rise above 5% by 2020; even under the most optimistic funding scenarios.

RTD currently spends about $23 million per year to operate the Stockton portion of its network. Under a status quo scenario, that amount will likely rise to over $31 million per year by 2020. For that amount of money the system will only be keeping pace with total travel growth and won't be making any inroads in VMT (vehicle miles traveled) reduction or GHG reduction. To gain ground in those categories the amount of annual spending on transit operations will need to reach a level

between $35 million and $51 million by 2020. In this economic environment RTD will have a difficult time just finding the money for the status quo scenario; it's hard to envision how the agency will find the operating or capital funds needed to increase the mode split to 5%.

Recommended Transit Improvements

1. Serving the Villages – Several of the Villages proposed in the General Plan are located in areas that can't be easily be served in a cost effective manner with standard transit service, let alone a Rapid Bus program. For that reason, Nelson\Nygaard recommends that any Village not located on or immediately adjacent to one of RTD's currently proposed Rapid Bus routes not be served by new Rapid Bus services. Instead these outlying Villages should be served by traditional local bus routes that connect to Rapid Bus routes.
2. Arch-Sperry Corridor Project – The City of Stockton is already moving ahead with this project which will provide a seamless roadway connection between the San Joaquin County Hospital Area and the Airport. Closing this "roadway gap" will give RTD new opportunities to design effective and efficient bus routes in this part of the city. This corridor should be utilized to improve bus routes in this portion of Stockton.
3. West/Airport Bus Rapid Transit – RTD already has two Rapid Bus routes in operation and will be starting a third route (Hammer Lane) within the next few years. Beyond that, a new study should be conducted to evaluate the potential for additional routes. One of the most promising is likely to be West/Airport. This line would start and end in the vicinity of Eight Mile Road and Downtown Stockton. The estimated capital cost of this proposed route is $2 million and the annual operating cost will be approximately $2.3 million.
4. Additional Bus Improvements – RTD might wish to consider combining Routes 51 and 52 (would result in higher frequency along shared alignment). RTD should also consider an increase in frequency on Route 55. These improvements would require one (1) additional bus ($500,000) and an additional $500,000 in annual operating costs.

Car Sharing and Information Services

One of the obstacles that can keep people from using public transit service is something called "the last mile barrier." A transit agency can provide a comprehensive, frequent and robust transit service but if potential passengers can't easily access the system then it becomes highly unlikely they will use it. As an example, a transit agency may provide customers excellent bus stop facilities. However, if access to those stops is inhibited by lack of sidewalks or lack of safe crossings of busy streets, it is unlikely that people will be drawn towards using transit.

Last mile barriers can cover a range of issues. Nelson\Nygaard explored last mile barriers in Stockton and determined that the best opportunity for erasing some of the barriers could come from a simple, low cost Peer to Peer car sharing program like "GetAround" (www.getaround.com). In a Peer to Peer car share program, individuals make their personal automobiles available for rental to other individuals through an on-line registration and reservation service. The objective of this program is to provide a low cost and convenient way for people to get access to an automobile. When linked with good transit service, a car sharing program can help people overcome their individual last mile barriers and make transit a more attractive modal option for the primary length of their trip.

Nelson\Nygaard also included a recommendation to increase the amount of transit/transportation information that's available to potential transit passengers. Recent studies have shown that

people are more willing to leave their cars at home and become multimodal (walk, bicycle or take transit) if they feel they have right at their fingertips the information they need to make informed choices. We are recommending that the City of Stockton work with RTD and SJCOG to develop on-line applications that people can access via smart phones to get real time information about trip planning, modal choices, comparative fares, and travel times. A program like this could be tied in to SJCOG's existing Commute Connection program.

Transit Supportive Policies

Nelson\Nygaard reviewed a variety of existing reports including the 2035 General Plan Update. Based on this review, and our work in similar cities, we've developed a list of policies that the City of Stockton should consider adopting to help create a more transit supportive environment. The 2035 General Plan Update already includes some transit supportive policies but in most cases they simply don't go far enough. The policies we've developed fall into the following nine categories:

1. Transit
2. Parking
3. Land Use/Municipal Codes/Growth Management
4. Public Space
5. Building Scale
6. Travel Connections
7. Housing
8. Economic Development
9. Developer Coordination with SJCOG and the Congestion Management Program

Funding and Action Plan

The document provides an overview of existing and potential funding sources that the City of Stockton and/or RTD can pursue to pay for the improvements listed in the Action Plan. The sources included Federal, State and Local options. This document also provides an overview of coordination efforts and a recommended Action Plan.

As the City of Stockton and RTD move forward with their respective implementation activities, they should remember that there are already several adopted goals and objectives in the 2035 General Plan which specifically support coordination efforts between the two entities. These goals include:

- Transportation is both a local and a regional issue. Effective improvements to the transportation system depend on the multijurisdictional cooperative efforts of multiple agencies beyond the City of Stockton, such as the State of California, the San Joaquin Council of Governments, San Joaquin County, the San Joaquin Regional Transit District, and adjacent cities.

- The City shall work with the County, SJCOG, Caltrans, SJRTD, and other jurisdictions and agencies to secure additional funding to meet transportation funding shortfalls for priority projects and other modes of transportation (e.g., bike and transit).

- The City of Stockton is looking for the General Plan to facilitate an effective and efficient alternative to the City's current reliance on the automobile. The policies under this goal cover topics ranging from the integration of transit into the transportation network to the clustering of land use necessary to make these options a reality. A significant new feature in the transit framework of Stockton's future is the establishment of a BRT concept. The proposed BRT system will provide convenient access and integration of both new development areas (villages) and existing neighborhoods within the City (districts).

- The City shall work cooperatively with the San Joaquin Regional Transit District, the Altamont Commuter Express (ACE), the San Joaquin Council of Governments, Bay Area Rapid Transit (BART), Caltrans, AMTRAK, and other public transit providers to provide rail and bus service at a level that offers an alternative to the automobile for both the short and long distance commuter, and provides basic transportation to work, shopping and other destinations, especially for the handicapped, elderly, youth and economically disadvantaged.

A summary of the action plan is provided in Figure 1.

Figure 1 Action Plan

Category	Action Item	Description	Responsible Entity	Timeline	Cost (Capital, Operating or Both)	Potential Funding Sources (Best Opportunities)
Last Mile Barriers	Peer to Peer Car Sharing Program (stand-alone or built upon SJCOG's Commute Connection)	Implement a car sharing program amongst residents in key neighborhoods	City of Stockton & SJCOG	FY 2014/15	Low cost program for the city. Annual marketing < $20,000 Website development < $10,000 Neighborhood Surveys <$30,000	Transportation Impact Fees City of Stockton AQ Mit. Fees Public Private Partnerships
Last Mile Barriers	Multi-modal Information Program	Implement a new comprehensive multi-modal traveler information program for mobile devices and desktop computers	City of Stockton & SJCOG & RTD	FY 2012/13	Initial start up and maintenance costs need to be further refined. Capital Cost Software - $75,000 Annual marketing and upkeep - $50,000	Measure K San Joaquin Valley AD eTrips
Transit Supportive Policies	Implement a variety of new policies and programs to support transit services and multi-modalism[1]	1. Create Transit Overlay Zones 2. Reduce parking requirements for residential and commercial uses 3. Recommend to project applicants that they maximize project densities, especially along transit corridors or within Transit Oriented Developments 4. Increase space allocated throughout the city to Park and Ride Lots 5. Increase van sharing programs 6. "Unbundle" parking for developers 7. Create a parking cash-out program 8. Install municipal parking meters and a pay station in Zones 1 & 3 9. Charge local market rates for parking 10. Encourage medium to high density development along Pacific, Hammer, West corridors 11. Require commercial/retail parking be moved behind buildings for new developments 12. Create or expand upon ped-friendly streets, crossings and transit facilities 13. Improve way finding signage between downtown and waterfront 14. Orient development and building layouts to recognize "1/4 mile" walk to transit rule of thumb. 15. Treat Weber/Miner streets as downtown corridors needing special, priority attention for housing, transit, ped, bike and safety improvements 16. Incorporate a "multi-modal" approach into assessment process for all new developments (i.e. does it work with	City of Stockton & RTD (for transit items)	Phased in between 2013 and 2020	Further analysis is needed to determine costs of the various programs	Measure K San Joaquin Valley AD eTrips Business Improvement District Central Parking District

[1] See section 5 for details on all proposed policies

		transit, ped, bike and cars?) 17. Seek Downtown Development Incentive Program funds and allocate them to development around transit 18. Seek FTA “New Starts” to upgrade bus stops 19. Encourage business to apply for Facade Grant Program 20. Provide incentives to developers to buy and flip SRO buildings to mixed-use housing 21. Work with local colleges and universities to create Satellite campuses in the downtown core. 22. Require all large development projects to coordinate with SJCOG on Congestion Management Programs.				
Funding Opportunities	Funding Earmarks, Partnerships, RTD taxes and City Air Quality Fees	1. Explore options to secure a Congressional Earmark for high priority transit enhancement projects like the extension of Bus Rapid Transit service. 2. Continue to explore public-private partnerships with major employers. Meet with them to explain Rule 9410 and how they can comply with this rule and assess their interest in bus stop sponsorships. 3. The city and RTD should begin to explore the potential interest, political climate and feasibility of implementing a parcel tax increase, stand-alone sales tax or other form of direct tax increase. 4. The city should explore opportunities to direct a portion of the revenue from its Air Quality Mitigation Fee Program to the support of BRT operations and capital programs.	City of Stockton & RTD	FY 2012/13	Costs and Revenues to be determined	Not Applicable
Funding Opportunities	RTD Fare Study and Related Programs	1. Complete the RTD Fare Study 2. Develop formal agreements with Stockton Unified School District to sell discounted students passes at schools and explore opportunities to partner for a Safe Routes to School grant. 3. Develop formal agreements with colleges and universities to offer subsidized or free passes with students, faculty and staff in exchange for “equitable funding contributions for RTD (U-Pass Program). 4. Evaluate the potential for fare increases in the short-term including regular fare increases to keep pace with inflation and to be consistent with peer services.	RTD	FY 2011/12	Costs and revenues to be determined	Not Applicable
Transit Service	West/Airport Bus Rapid Transit	Implement a new Bus Rapid Transit that operates at 15 minute headways	RTD	FY 2013/14	4 buses - $2.0 million (total) Annual Ops - $2.3 million	FTA 5309 TIGGER RTD Taxing Authority
Transit Service	Frequency increase on several local routes	Add service to improve frequency from every 60 to every 30 minutes on Route 55	RTD	FY 2013/14	1 bus - $500,000 Annual Operations - $500,640	FTA 5309 TIGGER RTD Taxing Authority

Section 1 - Task Objective and Outline

The City of Stockton is developing a Climate Action Plan (CAP) for reducing its Greenhouse Gas Emissions (GHG) to 15% below 2005 levels by the year 2020. Public transit, and transit supportive programs and policies, will play a role in this effort.

Nelson\Nygaard assisted the City in determining what actions are needed to:

- Improve the public transit network
- Eliminate potential last mile barriers that keep people from using transit
- Adopt transit supportive policies
- Identify long term funding solutions to support the existing and future transit system and transit-oriented-development

The final outcome of this effort is a comprehensive plan, with a program of specific actions and quantifiable measures, which the City can use to address issues in the CAP and assist the San Joaquin Regional Transit District (RTD) in identifying future policies/programs and related revenue sources to increase transit system utilization.

This document has eight sections. The remaining seven are:

- Summary of 2010 Transit Gap Analysis
- Summary of 2009 RTD COA
- Proposed improvements to the public transit network
- Recommendations for car sharing (eliminating a last mile barrier)
- Recommended transit supportive policies
- Funding Strategies[2]
- Action Plan

Although the City's General Plan Update timeframe extends to Year 2035, the recommendations in this report are focused primarily on actions that can be implemented before the 2020 GHG deadline. These actions will also produce benefits after 2020.

Consultant Activities

In completing its work, Nelson\Nygaard reviewed:

- RTD/City of Stockton 2010 Transit Gap Analysis
- RTD 2009 Comprehensive Operations Analysis
- RTD 2010 Unmet Needs Report
- RTD 2009 Short Range Transit Plan
- City of Stockton 2035 General Plan Update

[2] The funding information will be incorporated by EPS into a master funding plan for the entire CAP project.

In addition, Nelson\Nygaard staff made several field trips to the Stockton metro area to examine service area issues and attend meetings with City and RTD staff.

Section 2 – Summary of Transit Gap Analysis

In January 2010, the San Joaquin Regional Transit District (RTD) and the City of Stockton prepared a Transit Gap Analysis Report in response to the CAP Settlement Agreement. The Gap Analysis (Gap study) outlined a variety of service recommendations for the system plus potential transit supportive policies. Nelson\Nygaard staff has reviewed the Gap Report and believes the document should serve as the foundation for the 2020 public transit network plan.

The Gap study evaluated potential transit service issues in four areas:

1. Geographic coverage
2. Quality of service
3. Transit supportive policies
4. Transit supportive funding

The Gap Analysis also incorporated the findings and recommendations of the 2009 Comprehensive Operations Analysis (see Section 3).

Geographic Coverage

The Gap study found that the RTD's geographic coverage of the Stockton Metro Area is sufficient. Service will need to be physically extended to new developments on the edge of the service area, such as the proposed Transit Villages, when those projects come online. However, for the foreseeable future, the current physical coverage of the transit service is sufficient.

Quality of Service

The Gap Analysis noted that improving the quality of service would be beneficial towards attracting new transit riders. Potential service quality improvements including the following:

Increasing Service Frequency

Figure 2 presents opportunity corridors identified by the City and RTD suitable for attracting more passengers via more frequent service.[3]

Figure 2 Gap Analysis Proposed Service Frequency

Corridor	Current Weekday Frequency	Proposed Weekday Frequency	Current Weekend Frequency	Proposed Weekend Frequency
South Airport Way (BRT)	120	10/30 off-peak	60	30
Hammer Lane (BRT)	60	15	60	30
California Street	30	15	60	30
El Dorado Street	30	20	60	60
West Lane	60	30	N/A	60
Charter Way/MLK	N/A	30	N/A	60

[3] Source: Gap Analysis Report. The South Airport BRT has since become operational.

Improving Service Reliability

The industry standard for on-time performance is 90%-95%.[4] Poor on-time performance negatively impacts the customer's perception of service reliability and can make transit a less competitive option as compared single occupancy vehicles.

Recommendations include:

- Improve field supervision and driver training
- Add buses during peak periods to maintain schedules due to longer roundtrip cycle times
- Expand transit priority along congested corridors (includes Transit Signal Priority, queue jump lanes, bus bulbs, etc)

Service Span

Most RTD routes operate between 6:00am and 8:00pm on weekdays. Only half of the routes operate on weekends and most of those have very infrequent service (60+ minutes). The Metro Express routes operate every 15 minutes on weekdays between 5:00am and 11:00pm and operate every 30 minutes on the weekend. Figure 3 displays existing route by route service characteristics. The Gap report did not include any proposed changes to the service span.

[4] On-time performance means buses arriving at a stop no earlier than one minute ahead of schedule or departing no later than 5 minutes behind schedule.

Figure 3 RTD – Existing Route Characteristics[5]

Stockton Climate Change Action Plan
Transit Network Plan for 2012-2020

= Rapid Service (15 minutes or better)
= 30 minutes
= Average of 60 minutes
= Average more than 60 minutes

SJRTD Existing Services (2011)

Route	Type	Weekday Hours	Freq	Saturday Hours	Freq	Sunday Hours	Freq
23 Stockton Lodi	Regional	5:45am to 7:15pm	60/60	8:30am to 6:00pm	60	8:30am to 6:00pm	60
27 Stockton ARPT-Manteca-Tracy	Regional	5:30am to 8:30pm	90-120	8:15am to 5:45pm	120	8:15am to 5:45pm	120
40 Metro Express	Rapid Bus	5:00am to 11:00pm	15/30	7:00am to 8:00pm	30	7:30am to 8:00pm	30
44 Metro Express	Rapid Bus	5:45am to 7:30pm	10-15/off 30	7:30am to 7:30pm	30	8:00am to 7:30pm	30
51 El Dorado San Joaquin Malls	Local	6:00am to 11:00pm	45 to 60	8:00am to 6:45pm	90-120	8:00am to 6:00pm	120
52 California to Kaiser	Local	5:45am to 7:00pm	60	No Service		No Service	
54 San Joaquin-Houston-Manthey	Local	5:45am to 9:00pm	45 to 60	9:00am to 5:30pm	60 to 180	9:00am to 5:15pm	60 to 180
55 MLK to DTC	Local	5:45am to 8:15pm	60	8:45am to 6:00pm	120	9:30am to 4:15pm	120
60 Monte Diablo - DTC	Local	6:00am to 8:30pm	45 to 60	No Service		No Service	
61 Fontana - Malls (interline with Rt 80)	Local	5:45am to 10:00pm	60	No Service		No Service	
63 Ben Holt - Malls	Local	6:15am to 7:00pm	60	No Service		No Service	
65 Kelly - Don - Otto	Local	5:45am to 7:45pm	60 to 90	10:00am to 5:45pm	120	10:00am to 3:45pm	120
66 Ponce De Leon - Trinity	Local	6:00am to 6:30pm	80	No Service		No Service	
68 Swain-Malls	Local	No Service		9:45am to 5:00pm	120	10:00am to 4:15pm	120
71 West Lane - Holman	Local	6:00am to 9:45pm	60	9:15am to 6:00pm	60 to 120	9:30am to 4:45pm	120
73 Mariners - Holman	Local	5:45am to 8:00pm	60	9:15am to 5:45pm	120	9:15am to 5:45pm	120
74 Hammer - Malls	Local	6:15am to 6:15pm	90-120	No Service		No Service	
75 Calworks - DTC	Local	6:30am to 6:15pm	80	No Service		No Service	
76 Eastland Plaza - Los Angeles	Local	6:15am to 7:45pm	50 to 90	8:45am to 5:15pm	90 to 150	8:45am to 5:15pm	90 to 150
77 Eastland Plaza to DTC	Local	6:00am to 5:00pm	60	No Service		No Service	
80 DTC - Oro	Local	5:30am to 10:30pm	50	7:30am to 6:30pm	150	9:00am to 5:45pm	150
81 El Dorado - DTC	Local	5:30am to 10:30pm	30 to 60	7:00am to 6:30pm	90-120	9:00am to 6:00pm	90-120
83 APRT to DTC	Local	6:00am to 8:45pm	30 to 45	8:00am to 5:15pm	120	8:45am to 5:00pm	120
85 Toglinanli - Airport Way	Local	6:30am to 10:00pm	75 to 90	7:00am to 6:15pm	75 to 90	8:15am to 6:15pm	75 to 90
1 Northwest Stockton	Hopper Local - Deviated Fixed Route	8:45am to 5:45pm	60	No Service		No Service	
2 Northwest Stockton	Hopper Local - Deviated Fixed Route	8:45am to 5:45pm	60	No Service		No Service	
3 Northeast Stockton	Hopper Local - Deviated Fixed Route	8:45am to 5:45pm	60	No Service		No Service	
4 Central Stockton	Hopper Local - Deviated Fixed Route	8:45am to 6:15pm	60	No Service		No Service	
5 Central Stockton	Hopper Local - Deviated Fixed Route	8:45am to 6:15pm	60	No Service		No Service	
6 Northeast Stockton	Hopper Local - Deviated Fixed Route	8:45am to 5:45pm	60	No Service		No Service	
7 South Stockton	Hopper Local - Deviated Fixed Route	8:45am to 6:15pm	60	No Service		No Service	
310 Charter - ACE - DTC	Weekday Ltd Crosstown	2 AM & 3 PM trips		No Service		No Service	
315 MLK - DTC - Houston	Weekday Ltd Crosstown	1 AM & 3 PM trips		No Service		No Service	
325 Pacific - Myrtle	Weekday Ltd Crosstown	6 trips for the day		No Service		No Service	
330 Pershing - DTC	Weekday Ltd Crosstown	1 AM & 2 PM trips		No Service		No Service	
335 Pershing - Thornton	Weekday Ltd Crosstown	1 AM & 1 PM trip		No Service		No Service	
340 Morada - Bianchi	Weekday Ltd Crosstown	1 AM & 1 PM trip		No Service		No Service	
345 Kermit - Kaiser	Weekday Ltd Crosstown	3 AM & 2 PM trips		No Service		No Service	
360 Alpine - Holman	Weekday Ltd Crosstown	1 AM & 1 PM trip		No Service		No Service	
390 Pock - Myrtle	Weekday Ltd Crosstown	1 AM & 1 PM trip		No Service		No Service	
370 ARPT - Rosemarie	Weekday Ltd Crosstown	1 AM & 1 PM trip		No Service		No Service	
380 Myrtle - Charter	Weekday Ltd Crosstown	2 AM & 1 PM trip		No Service		No Service	
PLUS							
17 Interregional Routes (to large employers)							

Improving Ease of Use

Many of RTD's routes are circuitous, contain out of direction segments and/or are difficult for passengers to understand because of various deviations. In addition, the system is not based on memory or clock face headways. Many routes operate on different frequencies throughout the day (e.g. trip number #1 on a route is 45 minutes, trip #2 is 60 minutes, trip #3 is 50 minutes, etc). This time variability can be extremely frustrating for passengers because it makes it nearly impossible for riders to internalize frequency and their expected wait time. Experience has repeatedly shown that people are much more willing to use transit if they don't have to think about

[5] Chart created by Nelson\Nygaard.

it. Moving to clock-face headways (e.g. Route #1 buses leave every 30 minutes at :15 and :45 after the hour) and increasing frequencies are important ways to make the system more user friendly and thus attract more passengers.

Expand Bus Rapid Transit (BRT)

Bus Rapid Transit routes provide fast, frequent, reliable and easy to understand service along key corridors. RTD now has two BRT routes operating in the Stockton Metro Area:

- Metro Express 40 (Weber Transit Center to Hammer Lane via Pacific Avenue)
- Metro Express 44 (Weber Transit Center to Stockton Airport via South Airport Way)

BRT should only be implemented along corridors where: 1) development and density can provide the ridership potential that supports the transit investment and 2) transit can ultimately be given higher priority for traffic operations than automobiles.

The City's General Plan identifies several future BRT corridors, some of which are on the fringes of the metro area and which would connect the proposed Transit Villages to the central core of the City. In the Gap report the following recommendations were included regarding potential BRT services:

- Implement a new cross-town BRT route on Hammer Lane by 2013[6]
- Conduct a comprehensive study that focuses on prioritizing future BRT corridors (e.g. West Ln., Charter Way/MLK Blvd., El Dorado St., California St.)

Implement New Service Standards

The RTD must implement new standards to discourage the provision of unproductive services while improving its use of existing resources. Resources must be allocated to the areas with the maximum amount of ridership potential.

Transit Supportive Policies

The effectiveness of transit service is a function of: 1) the design of the system and 2) its operating environment. Transit planners can directly influence the design of the system but they have little or no control over the operating environment. For that reason, it is critical to the long term viability of the system to have the City of Stockton implement transit supportive policies. These would include:

- Promote in-fill development where transit service already exists
- Provide transit with operational priority on key corridors
- Promote transit supportive development along key corridors
- Provide efficient transit service to new Village development in the outskirts of the Stockton area.

[6] In July of 2010, the RTD received a $5.2 million grant for the Hammer Lane Bus Rapid Transit (BRT) Corridor project through the Federal Bus and Bus Livability Grants Program. RTD is currently preparing a final plan for implementing this service.

- Encourage local transit use - The General Plan must stress the importance of local transit provision for short, every-day trips. The General Plan currently emphasizes longer-distance, higher profile forms of transit for longer trips, especially those traveling outside of the City, while the vast majority of transit service and ridership is within the City's core area.
- Ensure that the General Plan spells out specific requirements for Transit-Oriented Development.

Transit Supportive Funding

The General Plan policies which relate to funding transit improvements are purposely broad and nonspecific and will need to be refined in the future to better address appropriate funding measures through the development of the Transit Program. Types of funding sources should be tied to the location and amounts of people and businesses benefitting from the improvements, and whether funding needs stem from current or future sources. This will better help to link the necessary improvements and the revenue used to fund them.

RTD is facing capital and operating funding shortfalls due to decreases in local and State revenues. Transit service requires a dedicated source of funding to address the improvements noted in Gap study. The proposed improvements in service will require roughly $4.5 million in increased operating costs and $6 million in capital costs. This capital amount does not include the money needed for a new maintenance, operations and administration facility for RTD. The City and RTD should explore any and all reasonable options for securing long term sustainable funding to support capital projects and operations.

Section 3 - Summary of 2009 RTD COA

The 2009 COA (Comprehensive Operations Analysis) provides a detailed look at RTD's entire regional network including the Stockton metro area. It covers:

- Assessment of transit needs
- Review of existing services and service framework
- Preferred service and fleet plans
- System finance

RTD's network, including the portion within Stockton, is predominately a "coverage based" system. Most of the routes come together at the Downtown Transit Center in downtown Stockton. Most of the local routes provide fairly infrequent service (headways longer than 45 minutes). The exceptions are the two Metro Express (BRT) Routes that operate on peak period headways of 15 minutes.

RTD operates 64 routes, covering a variety of services including:

- Local bus
- Intercity
- Limited/Peak
- Hopper (deviated fixed routes)
- Inter-regional commuter

Five of the sixty four routes (all five are in the Metro Area) account for 50% of the total weekday ridership.

The COA recommendations were divided into two implementation phases. Phase I recommendations (Years 1 to 3) consist primarily of route realignments designed to improve schedule adherence and remove complexity. Phase I was implemented in late January 2011 with the introduction of the Metro Express: Airport Corridor BRT service. RTD has not had sufficient time to collect data at a level that would be sufficient to review the effectiveness of this first phase. RTD expects to complete this assessment after observing six months of effective service data.

The Phase II recommendations (beyond Year 3) were based on the assumption the RTD would successfully obtain additional operating and capital funds in the near future. The recommendations focused on corridor level improvements (higher frequency, Bus Rapid Transit services, etc) for Hammer Lane, California St, El Dorado St, West Ln and Charter Way/MLK. The primary improvement was the implementation of Bus Rapid Transit on Hammer Lane.

The COA also noted that RTD is moving ahead with plans to build a new consolidated maintenance/operations/administration facility in the northwest corner of the Highway 99/Highway 4 interchange. This facility will replace the two existing bases. Ideally it will become operational in 2013 but this date is contingent upon RTD securing a full funding package, something that has yet to be finalized.

Section 4 – Proposed Transit Improvements[7]

Impact of Low "Baseline" Level of Service

During Nelson\Nygaard's field work and subsequent discussions with RTD staff about potential transit improvements, it became clear that attracting new riders to the transit system over the next decade could be very difficult for one important reason – RTD currently provides low "baseline" level of service relative to the size of its service area.[8] In order for a transit system to be effective, it must provide a baseline level of service that adequately reflects the size of the population and service area. An industry standard for mid-size city systems like RTD's is .70 annual revenue hours per capita and 3,100 annual revenue hours per square mile of service area. In terms of output (effectiveness) a system in this category should carry roughly 70,000 passengers per year per square mile of service area. In addition, the average person in the service area should use the system 20 times or more per year.

Nelson\Nygaard conducted a brief peer[9] review to test its theory about the perceived low service levels in Stockton. The peer systems were chosen based on their:

- Geographic location (Central Valley)

[7] Nelson\Nygaard has assumed that RTD will continue to be the primary transit provider within the City of Stockton. Therefore, the recommendations in this section apply primarily to RTD. Action items for the City are specifically noted. Beyond that, the City can certainly play a role in helping transit via traffic and street operational improvements in the primary corridors. These opportunities are discussed later in the document.

[8] This assessment has nothing to do with the quality of service provided by RTD but instead speaks to the sheer amount of service being provided given the size of the area and number of people.

[9] A peer review was not included in the Scope of Work but was included by Nelson\Nygaard in this Technical Memorandum as a value-added component.

- Service area demographics
- Service area size and terrain
- Service complexity (i.e. no rail systems).

Findings - RTD's existing transit network provides significantly less service (per capita and per square mile) than the peer systems (see Figure 4). This low baseline level of service contributes to RTD's low level of effectiveness relative to the peer group and represents a potential hurdle towards improving effectiveness and capturing new riders.[10] Just increasing service to the baseline of the other systems could involve a 20% increase in annual operating expenses or roughly $4 million.[11] This in turn limits the amount of revenue available to take transit service to a higher level where it can begin to attract choice riders and make significant inroads on reducing GHG emissions.

[10] Productivity – Transit services within Stockton operated at a system wide average of 20 passengers per hour in 2008. The introduction of Rapid Bus service over the last two years has no doubt helped increase the average a bit, but even with that it's unlikely that system-wide productivity in Stockton has reached 25 passengers/hour. If this system is going to cost effectively capture new riders then it must significantly increase the system's productivity rate, and that means striving for a 2020 target that's at or above 30 passengers/hour. Trying to reach this target almost certainly precludes extending/expanding service anywhere except in the high ridership corridors and that almost certainly eliminates the idea of extending BRT service to the proposed transit villages if they are built before 2020.

[11] In 2008 it cost $104/revenue hour to provide service in the Stockton Metro Area (Source: RTD). This cost includes fuel, maintenance, administration, marketing and various other costs. It is also inclusive of the largest cost component; driver's salaries. 2008 data was the most recent data available for this analysis. With this information, we can reasonably assume that the cost has likely increased in the past few years. By comparison, Bakersfield's cost/hour is in the mid $80/range and Fresno is in the mid $90/range. If Stockton was in the mid $90 range it would have an additional 20 to 25,000 annual revenue hours available to upgrade the network. That would be sufficient money to pay for the extension of one of the existing BRT lines and operate a new one without securing any new revenue. Although Nelson\Nygaard has not been able to explore RTD's cost structure in any detail, it's not unreasonable to assume that the largest factor contributing to the cost differential between RTD and the other systems is probably the differential in prevailing operator wages. Operator wages typically account for as much as 80% of total system operating costs. A good place to start for assessing the cost differential issue in more detail would be with a comparison of the Union Operating Contracts for each system.

Figure 4 Central Valley Transit Peers

						Density of Service (input)		Usage (output)		
Cities	Population	Square Miles	Pop. Density	Annual Rev Hours	Annual Transit Passengers	Rev Hours/Pop	Rev Hours/ Sq Miles	Passengers/ Rev Hours	Passengers/ Population	Passengers/ Sq' Mile
Stockton	292,000	65	4,492	197,089	3,958,472	0.67	3,032	20.1	13.6	60,900
Fresno	505,000	104	4,856	372,000	16,900,000	0.74	3,577	45.4	33.5	162,500
Bakersfield	338,000	92	3,674	286,000	7,500,000	0.85	3,109	26.2	22.2	81,522
Modesto	211,156	39	5,414	110,000	3,300,000	0.52	2,821	30.0	15.6	84,615

Source Data

Stockton		Fresno		Bakersfield	
Population	City website	Population	Fresno COG Website	Population	City website
Sq miles	City website	Sq miles	Wikipedia	Sq miles	City website
Annual Rev Hours	RTD SRTP pg 35	Annual Rev Hours	FAX SRTP	Annual Rev Hours	NN Existing Conditions Report
Annual Passengers	RTD SRTP pg 35	Annual Passengers	FAX SRTP	Annual Passengers	NN Existing Conditions Report

Planning Assumptions

Nelson\Nygaard's recommendations for transit improvements are based on several key assumptions:

1. RTD will continue to be the primary provider of local bus service within the Stockton metro area.

2. Until 2020, perhaps even longer, all local public transit service will continue to be provided via a combination of local bus, Bus Rapid Transit and Dial-A-Ride service. Implementation of any type of rail service (light rail, etc) within the city limits is simply not an option due to the short term planning horizon and the lack of potential funding.

3. Given the economic outlook for the next decade and the existing/proposed development, Stockton in 2020 will probably not look significantly different than it does today. Certainly there will be opportunities for in-fill projects along important corridors like Hammer Lane and Pacific Avenue and possibly in the downtown core, but in general the overall look and feel of Stockton 2020 won't be substantially different from what exists today. It will most likely remain a city consisting primarily of low density single family housing with some higher density development along certain corridors like Pacific and Hammer Lane.[12] In order for transit to provide a substantive "bang for the buck" in terms of GHG reduction, the largest percentage of transit resources will need to be focused in:

- High density corridors (Pacific Ave, Hammer Lane, West Avenue, etc)
- Colleges (UOP, Delta, Stanislaus and Humphreys)
- Downtown core as it is redeveloped (this is the area bordered by Highway 4, Wilson Way, Park St and Center St

The Reality of Transit's Modal Share

Nelson\Nygaard calculated a basic "non-model" estimate of transit's mode share split for the City of Stockton.[13] Based on the 2008 RTD ridership of 3.9 million in the metro area, and assuming a generous mode split for all transit trips of 3.0%, Nelson\Nygaard estimated that the total trips for all modes within the metro area was approximately 132 million in 2008. For additional detail, please refer to the Appendix.

The population of the metro area is expected to grow at roughly 1.5% annual through 2020. The Climate Action Plan caps the growth in VMT for the metro area at 1% per year. That means that by 2020, total annual trips in the metro area should grow to 148 million. Just to keep pace with that level of growth, and to avoid losing any percentage of mode split, transit would also need to grow at roughly 1% per year. If we assume no improvement in transit productivity and that annual operating unit costs rise at a rate equal to inflation (2.5%) then the annual cost to provide

[12] The term "high density corridor" as used in this report generally refers to a corridor that's at least 3 to 4 miles long, and has a consistent mixture of high density housing (above 15 units/acre), employment and activity centers (schools, shopping, libraries). It should also have opportunities for redevelopment. These are the typical physical characteristics that create a viable market for high quality, frequent, all-day transit service.

[13] This mode split analysis is not intended to supersede the detailed modeling work that will be conducted by Fehr and Peers later in the study. The NN work is only intended to provide a "reality" check for transit improvements. This modal estimate does not include any ridership projection for the ACE regional commuter rail system.

transit service in 2020 will reach **$31 million** (Scenario #1). The current annual metro area transit operating costs are approximately $22.7 million. In other words, just to "tread water" transit will need roughly $9 million more per year, or 41% more for operations in 2020 than it does today. It's doubtful that an additional $9 million in annual operating funds per year can be generated under any financial scenario before 2020.

If transit is needed to play a significant role in reducing green house gases then the growth in transit ridership will need to significantly outpace growth in VMT or population. Nelson\Nygaard estimates that transit ridership would need to grow by an average of 5.4% per year in order to achieve a mode share split of 5% by 2020; a modal ratio at which transit begins to seriously contribute to GHG reduction.

What would it cost to achieve that type of mode split? If RTD's cost structure and service efficiency remains unchanged over the next decade, then the system will need roughly **$51 million** for annual operations by 2020 (Scenario #2). That's $20.7 million more for Year 2020 operations than what's needed under the Scenario #1 (Baseline)

If we assume that RTD's unit costs can be decreased and its productivity can be significantly increased (Scenario #3), the system will still need almost **$35.7 million** per year for operating costs by 2020. Herein lies the dilemma – RTD probably can't afford the $31 million year under 2020 (Scenario #1) let alone the $51.7 million needed for Scenario #2, or even the $35.7 million for Scenario #3. Asking the transit system by itself to capture a much higher mode split will either require a significant increase in operating funds and/or wholesale changes to RTD's system and its cost structure.

Nelson\Nygaard has had several conversations with RTD and City of Stockton staff about the reality of transit playing much of a role in significantly decreasing GHG emissions before 2020. It is the consensus of all three parties (City, RTD and NN) that given the projected economic environment, transit's current limited role in addressing city mobility, and its current low baseline level of service, it is unlikely that transit's share of mode split can be significantly increased by 2020. Therefore transit probably won't be able to contribute much more than it does today towards the effort to reduce GHG emissions by 2020. On the other hand, transit can start to play a more important role after 2020 and for that reason the city should still seriously consider implementing most, if not all, of the recommendations listed later in this document.

Some of the city's best opportunities for reducing SOV (Single Occupant Vehicle) trips over the next eight years will come from improvements made to the pedestrian and bicycle networks. These improvements will allow people to use either mode for short trips around town and for accessing the public transportation network.[14] Transit supportive policies (as outlined later in this document) should therefore be focused to support increased opportunities for walking and bicycling, especially in "transit-oriented" corridors.

The one area where transit can have a significant impact on changing travel patterns over the next decade is in the area of transportation to/from the local colleges and universities. This idea will be explored in more detail in the Action Plan at the end of this Technical Memorandum.

[14] Fehr and Peers will be exploring pedestrian and bicycle improvements in a separate Technical Memorandum for this project.

Recommended transit improvements and actions (2012-2020)

RTD is already providing a relatively lower level of service per capita than its peer systems in the Central Valley. New financial resources for improving service might be very hard to come by over the next 8 years. For that reason:

1. RTD should avoid implementing any new services unless they are in transit corridors with high ridership potential and/or are commuter express services with viable employer markets. Implementing anything other than that risks diluting the existing resources and lowering productivity, thus making it harder to gain ground on GHG reduction.
2. Any opportunity for streamlining or straightening routes, and/or reallocating existing resources should be pursued. Most of RTD's routes in the metro area are circuitous because of physical barriers. Combining that issue with the very infrequent level of service translates into very little in the way of services that might be reallocated to more productive uses. Yet, there still might be places where routes can be straightened and/or combined to provide single routes with higher frequency and thus more appeal to potential passengers. For example, County Hopper Routes 90 and 91 might be terminated at the Weber Transit Center where passengers can transfer to Metro Express Route 40. As an example, RTD might explore combining Routes 51 and 52 into a single route that serves California and West, providing service every 30 minutes on the eastside between Hammertown, downtown and the County Hospital.

Serving the Proposed Villages

As noted in the summary of the Transit Gap Analysis report, RTD already provides ample physical coverage of the existing service area. This raises the question of what to do with any new developments that will require RTD to extend service beyond its current route network.

The General Plan outlines an approach for developing "Villages," some of which will be located beyond the edge of the current transit route network. The plan also calls for Bus Rapid Transit service to be extended to most of these areas.

These Villages, while certainly creating more ridership potential than traditional single family suburban style developments, won't create nearly the level of transit potential that's possible along the main corridors of Pacific Avenue, Hammer Lane, West Lane, etc where transit service already exists.

For the proposed Villages which are immediately adjacent to existing or proposed RTD Rapid Bus Corridors (e.g. the Sanctuary at the west end of the pending Hammer BRT corridor) the city should proceed with its plans to provide a direct link to the BRT network. For those proposed Villages which are not adjacent to a BRT corridor, and/or which will require BRT service to travel through areas with low ridership potential (e.g. industrial or agricultural zones) Nelson\Nygaard recommends that the Villages not be directly served with BRT. Instead, the Villages should be indirectly linked to the BRT network with a less frequent and less expensive service (e.g. 30 minute headway local feeder routes). This approach will help maintain or even improve the overall efficiency and cost effectiveness of the transit system and in particular, the BRT network.

Addressing Geographic Barriers

The Gap Report identified three physical barriers that, if removed, could improve opportunities for a more efficient design of the transit system. The City of Stockton, SJCOG and/or Caltrans are responsible for addressing these items. These specific barriers include:

- Arch-Sperry Corridor Project – This project is listed as one of the top roadway improvement projects for both the City of Stockton and San Joaquin County. The City of Stockton was moving ahead with the first phases of this project as of early 2010. This project will certainly help freight and auto traffic in the area, and will provide a much more convenient connection for buses traveling to the SJ County Hospital complex from the Airport and South Stockton areas. The City's General Plan does show a Bus Rapid Transit route operating on Arch/Sperry between the airport and the Hospital. Nelson\Nygaard does believe that this new roadway connection would be beneficial for basic local bus service, but given the projected low employment and housing density in the area we do not believe that service in this corridor should include Bus Rapid Transit.
- Westside Connection - There are limited opportunities for north south travel in central Stockton between Pershing and Interstate 5 because of the canals that cut off access between Brookside/River and Shimzu/Canal. While it would be optimal to have a north-south bike/ped/transit connector roadway in this area extending from Monte Diablo to March Lane, Nelson\Nygaard believes it is not critical to the success of the RTD system. According to a transit demand assessment completed for the 2009 COA Project, this area exhibits only moderate potential for generating transit ridership. There are many other areas within Stockton that exhibit much greater opportunities for transit that do not require extensive new roadway connections. Nelson\Nygaard would rank a central-westside connector project low on the list of potential future projects for the City and RTD.

Proposed Service Improvements[15]

West/Airport Bus Rapid Transit

The West/Airport corridor seems to have a high degree of potential as a future transit oriented corridor all the way from downtown to Eight Mile Road. However, this corridor does need a significant amount of new development/redevelopment before it can take advantage of its ridership potential. This would be a new route with terminal points at Weber TC and West/Eight Mile Road (or West Hammer if no new development has been created north of Eight Mile Road).General characteristics of a proposed West/Airport BRT Route are shown in Figure 5.

[15] These proposed improvements are all the responsibility of RTD.

Figure 5 West/Airport BRT General Characteristics

Roundtrip Cycle Time	60 minutes[16]
Annual Revenue Hours	Weekday 255 days*18 hours*4 buses = 18,360 Weekends 100 days*12 hours*2 buses = 2,400 Total = 18,360+2400 = 20,760
Annual Operating Cost[17]	20,760 * $112/hour ($2011) = $2.3 million
Buses (for 15 min headway)	4 buses
Cost for buses	$2 million (4* $500,000/bus for electric hybrid 40')

Expanding other services

There are several routes that would likely generate new riders in a cost effective manner if their frequencies were increased from the existing 45-60 minutes to every 30 minutes all day. Routes 51 and 52 could physically be combined into one route with a new central city weekday frequency of 30 minutes (achieved by offsetting schedules). This wouldn't require additional vehicles or hours. Route 55 (Charter/MLK) could use one more vehicle to increase its weekday frequency to from every 60 minutes to every 30 minutes. Characteristics for this route modification are found below in Figure 6.

[16] Assume 12 miles roundtrip and 16 mph avg. speed

[17] This is based on Nelson\Nygaard assumptions about: 1) current fully allocated operating costs for Metro service and 2) weekday/weekend splits.

Figure 6 Route 55 Modification General Characteristics

Roundtrip Cycle Time	60 minutes
Additional Annual Revenue Hours (add one bus)	Weekday 255 days*14 hours*1 bus = 3,570 Weekends 100 days*9 hours*1 bus = 900 Total = 3,570+900 = 4,470
Additional Annual Operating Cost	4,470 * $112/hour ($2011) = $500,640
Additional Buses (for 30 min headway)	1 bus (45 to 60 minute RT cycle time)
Cost for additional bus	$500,000 for electric hybrid 40'

Emission Benefits for Proposed Transit Improvements

It goes without saying that moving people from auto trips to transit trips will help the City achieve its GHG emission reduction goals. The real question is...how much? In the next phase of the CAP project Nelson\Nygaard will provide input on potential transit modal share to Fehr and Peers as it models VMT reductions. ICF will then use the VMT outputs to model GHG reductions.

Section 5 – Recommendations for Car Sharing and Information Services

A specific hurdle that often deters users from using public transportation is what's commonly known as the "last mile barrier." People might live in an area with a terrific, robust and comprehensive public transit system, but if they can't easily get to or from the system they won't be able to use it. Transit access barriers can include poor pedestrian environments (sidewalks, lighting, etc), poor bicycle environments, lack of options like shuttles or car sharing and poor information. Nelson\Nygaard has explored the issues and believes options for reducing last mile barriers in Stockton are: 1) a car-sharing program and 2) better information about modal choices.

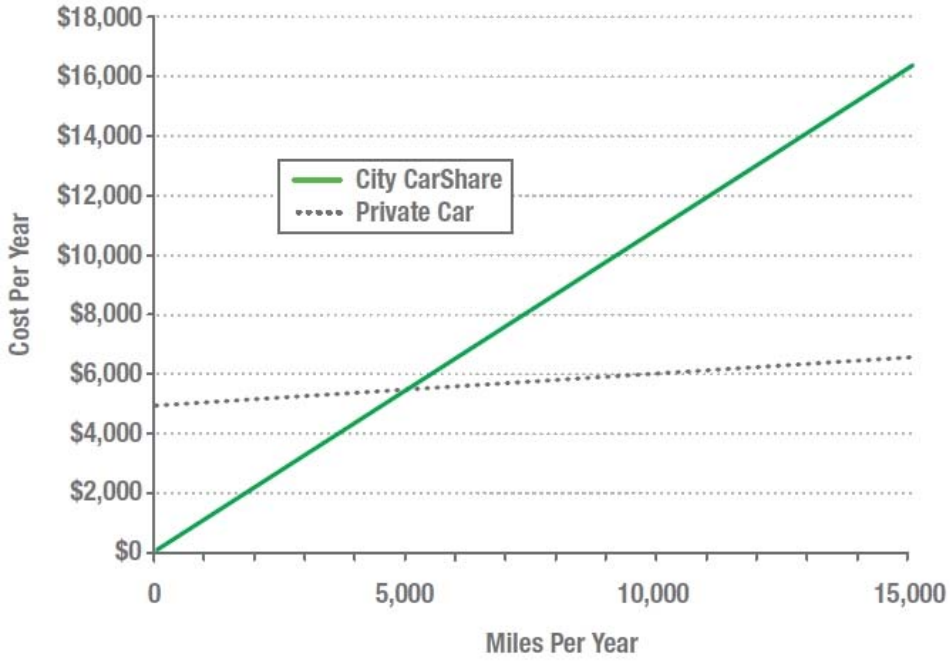
The Economics of Traditional Car-Sharing

The American Automobile estimates that the full cost of owning and operating a small sedan purchased in 2010 is $5,636 per year.[18] On a straight break-even approach, a car owner would start to save money if they used a shared-car on average less than 2 hours per day. Figure 7 from San Francisco's non-profit City CarShare, presents another way of assessing this

[18] Source: "Your Driving Costs 2010 Edition", American Automobile Association.

relationship between levels of car use and the cost-effectiveness of sharing versus own a car. As it shows, car-sharing is the better bargain unless you travel about 5,000 miles per year or more.

Figure 7 Cost of Owning versus Sharing Cars[19]



Source: City CarShare

There are therefore considerable opportunities to reduce travel costs via car-sharing, particularly for those able to replace a personally-owned (or leased) car with access to a car-sharing service. The ability to shed personal cars for shared-cars is dependent upon many factors, many of them directly related to the non-driving opportunities available within their community.

Part of a Multi-Modal System

A successful car-sharing program requires the support of a healthy non-auto based transportation system. A typical car-share member relies on transit, walking and bicycling to undertake the majority of their transportation needs. Most successful car-sharing operations in North America are in cities with excellent public transit systems. Universities with high parking costs also form excellent locations for car-sharing, as the walkable distances between housing and classes reduce driving needs to occasional off-campus trips.

Stockton's current lack of a robust transit system or a major campus population presents a challenging car-sharing market.

[19] Source: City Carshare Start-Up Guide pg 11.

Methodology

In evaluating whether car-sharing can work for Stockton, demographic factors proven to support car-sharing systems in other cities in North America were reviewed. In general, the same elements that support a healthy transit system also support car-sharing. These factors include density, mixed land uses and viable alternatives to car-ownership. Based on data from the American Community Survey, three demographic metrics were used to evaluate Stockton; residential density, the non-automotive mode share to work and educational attainment.

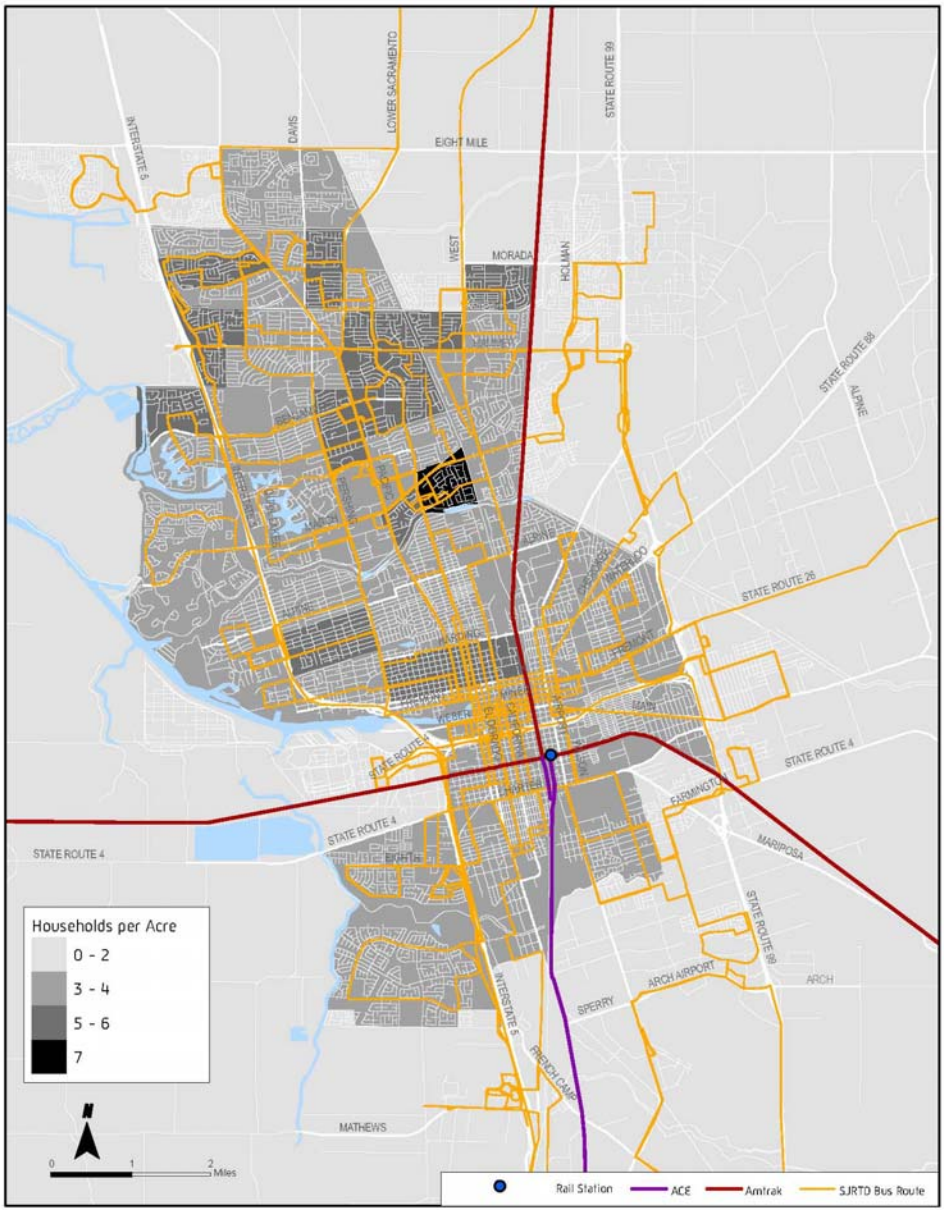
Each of these metrics is discussed in more detail in the below analysis.

Market Analysis

Density

The density needs of car-sharing services closely mirror those of transit. For transit, five units per acre is the desirable minimum for hourly service. Just as hourly transit service may be considered the lowest service standard for transit, similarly, six units per acre would be a bare minimum for a car-sharing location. A map of the density profile of Stockton in Figure 8 shows that peak density in the City tops out at about seven units per acre — ideally, 10 or more units per acre indicated a supportive car-sharing market.

Figure 8 Household Density



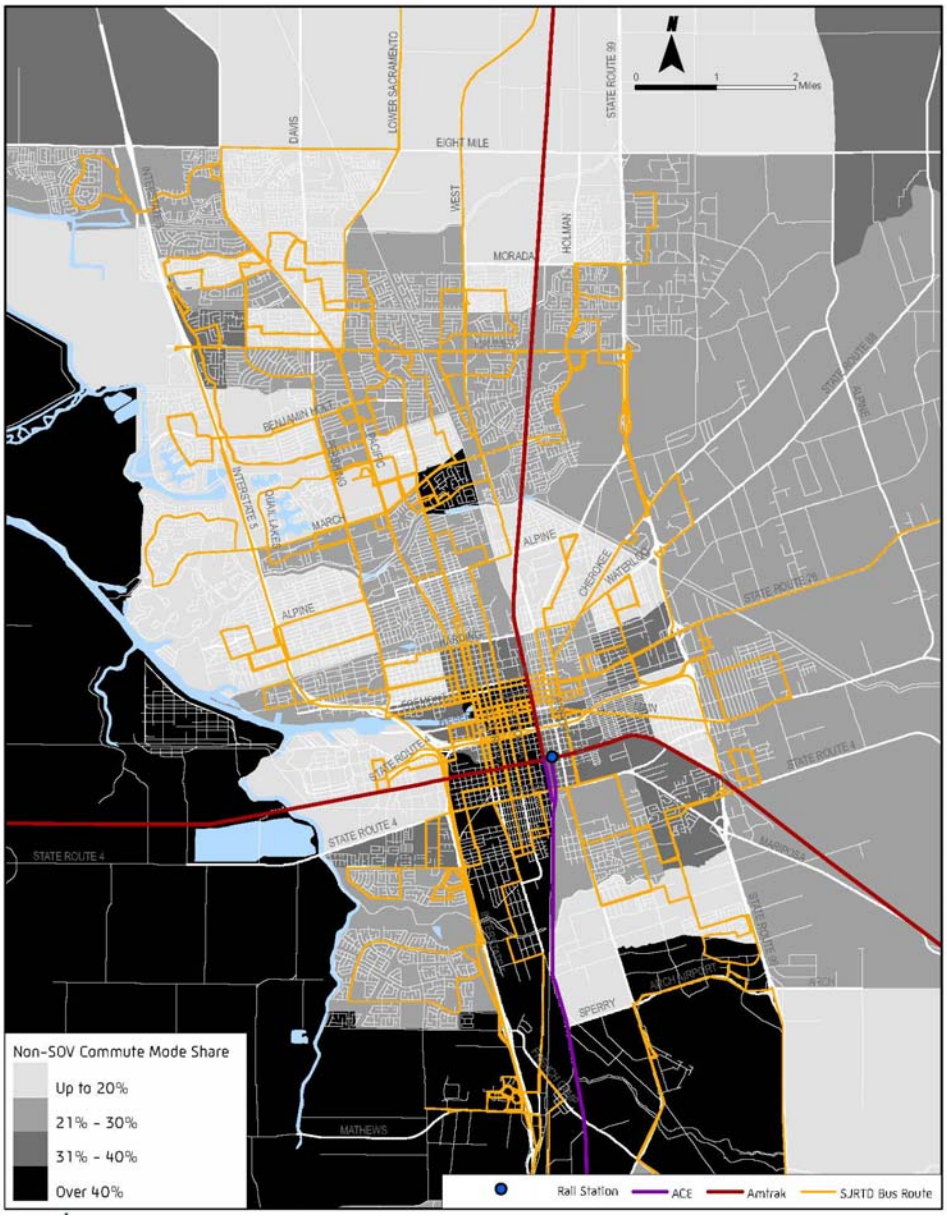
Source: Nelson\Nygaard

Non Auto Mode-share

Density alone will not ensure car-sharing success. One key to starting a car-sharing system is the existence of a core group of people who will benefit from the service. Potential cost-savings benefits of car-sharing are directly tied to how much a potential participant will drive each year. Thus, one of the primary indicators of the size of the car-sharing market is the number of people able to commute without a car. Non single-occupant-vehicle (non-SOV) mode share, therefore, is the primary demographic indicator of the size of this population.

Based on data from successful car-sharing organizations in North America, ideal car-sharing locations exhibit in excess of 40% of trips-to-work in non-SOV modes. Figure 9 shows Stockton census tracts and their associated percentage of residents who do not drive alone to work.

Figure 9 Non-SOV mode-share/ Stockton



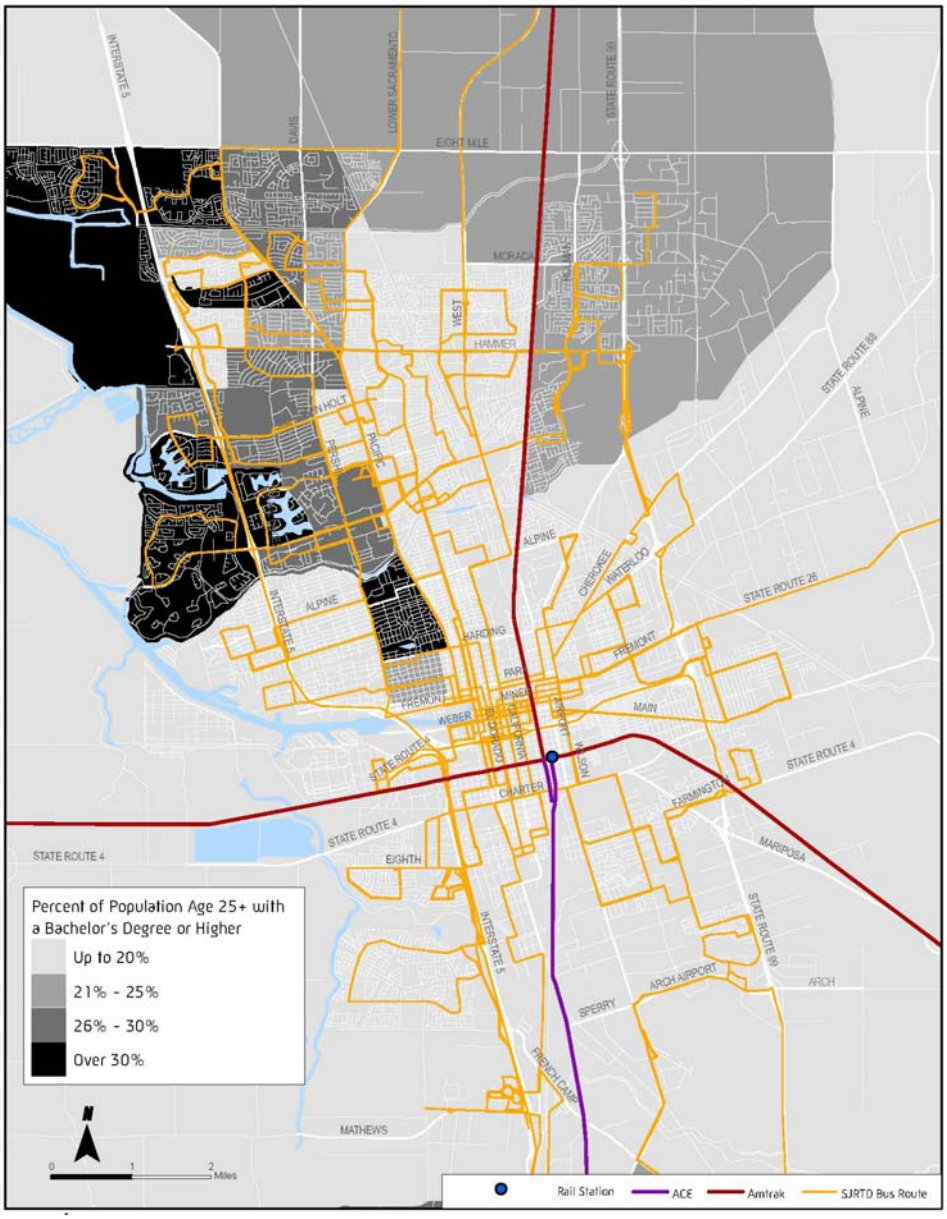
Source: Nelson\Nygaard

Census tracts that exceed the 40% non-SOV journey to work are limited. There are several centrally located tracts that show between a 30 and 40% mode share. A concerted effort to improve the non-SOV mode share in these neighborhoods could be part of a comprehensive strategy to improve the environment for both transit and car-sharing.

Educational Attainment

Another critical market indicator for car-sharing is educational attainment. Smart-phones and web-based reservation systems allow for members to reserve a car instantly. Credit card billing also facilitates instant hassle-free payment between the Car-sharing organization and the member. These same reservation and payment technologies form barriers to residents who live in low-education-level neighborhoods. In general neighborhoods with more than 25% of the population (age 25+) with bachelor's degrees or higher are good candidates for car-sharing. The map below delineates the education levels of neighborhoods in Stockton.

Figure 10 Educational Attainment



The census tracts in the northwest quarter of Stockton provide the best education levels for car-sharing. Adequate education levels must overlap with the density and non-commute mode metrics discussed above. These are analyzed in more detail below.

Summary

For car-sharing to succeed there must be a convergence of adequate density, non-auto mode-share and educational attainment all in the same census tract. These factors were cross-analyzed to determine if any overlap exists at ideal or close-to-ideal levels.

Figure 11 Ideal and Close-to-Ideal Demographic Metrics

Metric	Density	Non-Auto Mode Share	Educational Attainment
Ideal	6 or more units/ Acre	40% or more	30% or more
Close to Ideal	5 or more	31% or more	26% or more

Stockton falls short of meeting the traditional car-sharing model as currently practiced by organizations like City CarShare in the Bay Area or Zipcar. In order for a traditional car-sharing organization to place vehicles in Stockton, they would very likely require a guaranteed revenue stream to support the vehicle capital costs, insurance and administrative costs of running a car-sharing program in the City. Cities that have provided such revenue guarantees have paid an average of about $1500 per vehicle/ per month[20]. Because of these factors, Stockton is probably not a viable candidate for a traditional car sharing program.

Opportunities for Non-Traditional Car-Sharing

An emerging non-traditional car-sharing model known as Peer-to-Peer (P2P) car-sharing may offer Stockton the best chance to implement car-sharing as a means of addressing First Mile/ Last Mile issues in the city. P2P uses privately owned vehicles for car-sharing. This significantly reduces the cost of deploying vehicles by shifting vehicle costs to the car-owner and insurance costs to the driver on a pay-as-you-go basis.

In 2010, three peer to peer car sharing organizations were launched in the San Francisco Bay Area: GetAround.com, RelayRides.com and Spride.com. The following summary of P2P implementation and assessment of the potential for success in Stockton is based on interviews with key staff at all three organizations.

Peer to Peer Operational Model

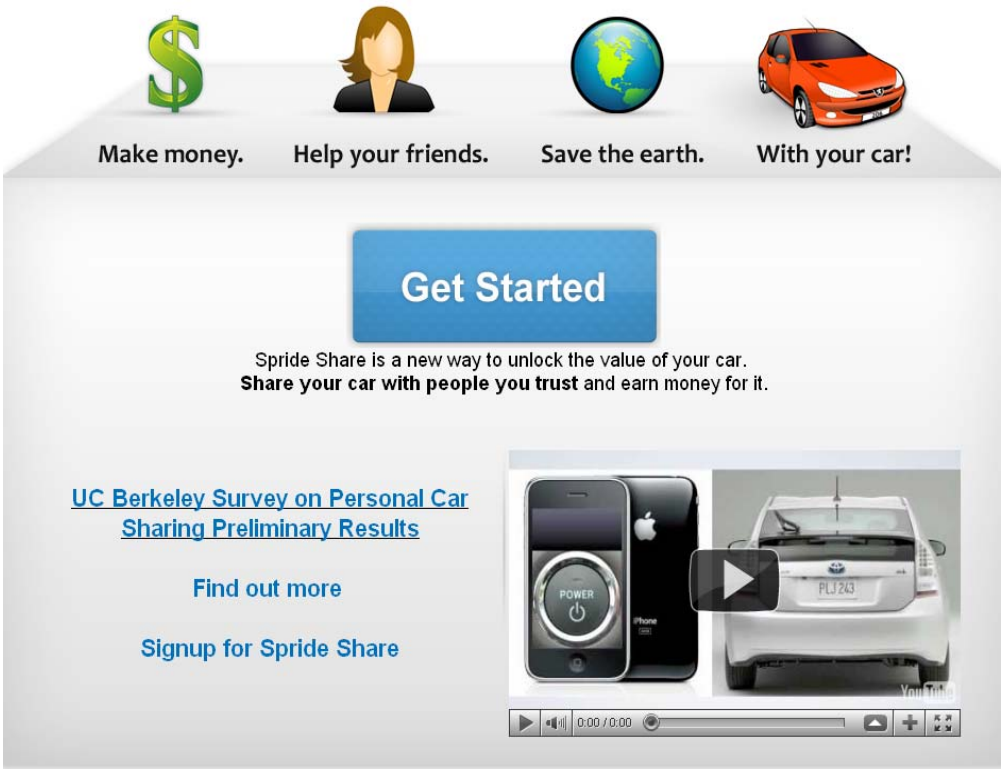
P2P organizations are first and foremost technology providers. A car-access and reservation system (commonly referred to as the “car-box”) is installed in the vehicle. This allows the car-

[20] http://www.annarbor.com/news/opinion/ann-arbor-dda-subsidy-for-zipcars-has-been-money-well-spent/

owner and members to reserve the car when they need it. It also limits access to just reserving members. The cost of the car-box is generally less than $500 per car.

Next, a website should be established that provides basic information on how to sign up for the program, how it works, etc. A sample home page is shown in Figure 12.

Figure 12 Sample P2P Organization Home Page



Source:Spride.com

Marketing Support

P2P providers universally report that it is easier to attract car-owners than car-drivers. Car-owners are very interested in sharing the expenses of owning and operating a vehicle. The challenge then lies in acquiring enough drivers to make the system viable financially for car-owners. Therefore any successful program in Stockton will require a comprehensive marketing program to insure its success. This need not be cost prohibitive. For example, one P2P organization is working with a west-coast city to set up a pilot program that includes the potential use of utility bills, the city's website, and neighborhood announcements to promote the program.

P2P Opportunities Summary

Stockton does not appear to be a good candidate for a traditional car sharing program. However, an alternate model in the form of peer–to-peer car-sharing is showing promise, and is already expanding within California with three companies now serving the San Francisco Bay Area. A P2P program can help more residents embrace public transit by removing a last mile barrier for non-commute trips. Nelson\Nygaard has already identified some neighborhoods where P2P might be successful (Figure 13).

Peer to peer car-sharing has far lower set-up costs than traditional car-sharing. The majority of the financial risk of the program is borne by the car-owner, rather than the car-share organization or the City. And, despite shouldering much of the cost burden of a P2P program, the minimal nature of these costs, and the potential gains to be had from offloading some of their ongoing car-ownership costs, car-owners have universally been the most willing participants within P2P programs.

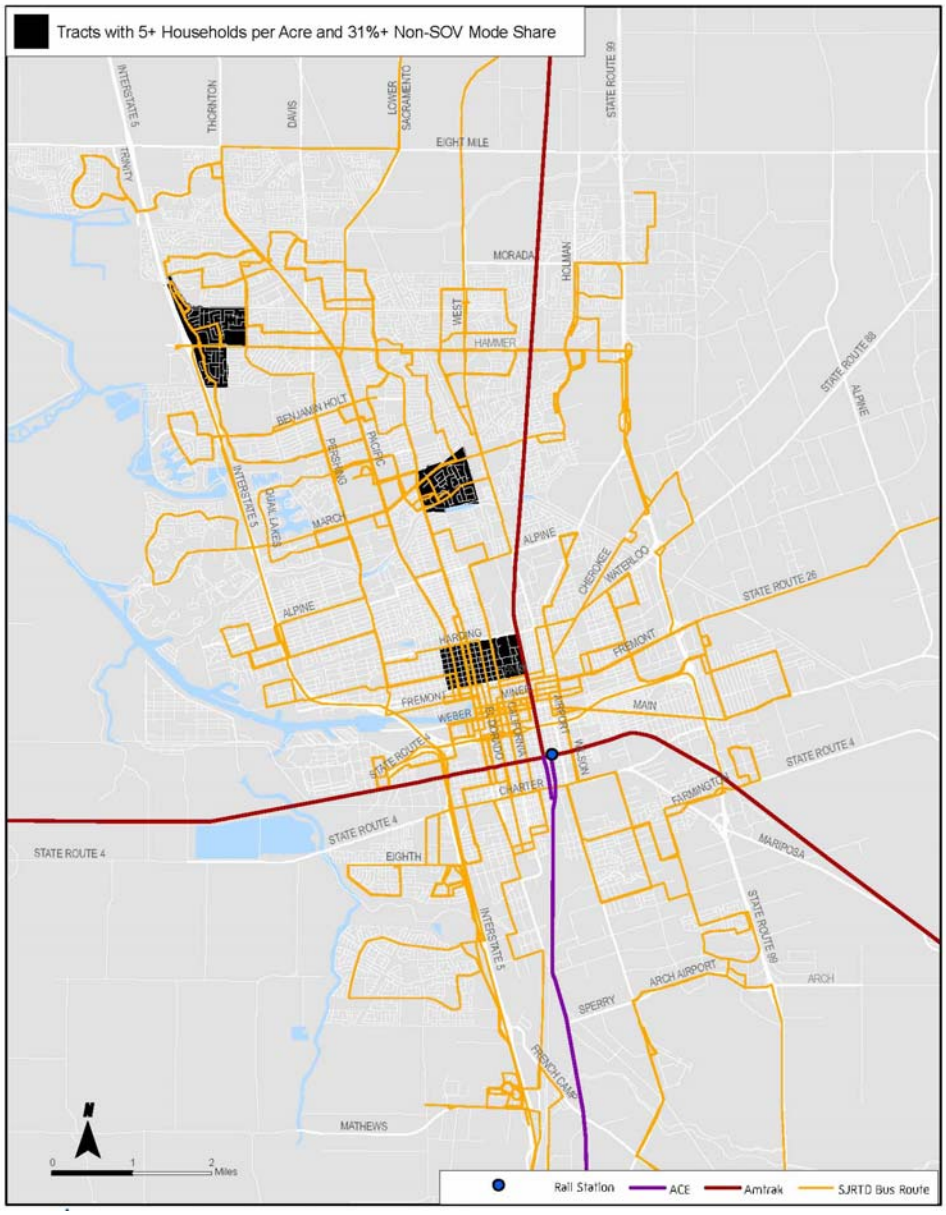
Setting up a P2P network in Stockton would seem to be fairly straight-forward. The challenge lies in getting riders to sign up to use the cars. All three P2P services interviewed indicated that this was the major challenge.

The City of Stockton can help move a P2P program forward by:

- Conducting neighborhood surveys to identify potential pilot neighborhoods
- Leveraging the City's communication resources to market P2P car-sharing
- Working directly with a P2P organization like "Getaround" (www.getaround.com) to jump start a service in Stockton

There might be an opportunity to work with the local colleges and large employers to promote this program. Lastly, the City should explore with SJCOG the potential to roll a P2P program into SJCOG's Commute Connection Ridesharing program.

Figure 13 Some Markets May Be Ready for P2P Car-sharing



Source: Nelson\Nygaard

Improving information services about modal choices

In a recent study conducted by Latitude (www.latd.com), survey participants who used a car as their primary form of transportation were asked to give up their cars for a week and rely solely on walking, bicycling and/or public transportation to get around their communities. The study was intended to address three questions:

1. How can new technologies improve not only public transit but also a person's larger experience of a community?
2. How can information access encourage people to make more sustainable transit choices?

3. Can technology help public transit make people feel more connected to each other and their community?

In many ways this study is an extension of the debate about conquering last mile barriers. The complete study can be found on the Latitude website. Granted, the study was conducted in two cities that have very good public transit systems, Boston and San Francisco, but the results are still promising enough to have some applicability in cities like Stockton that don't have the breadth of transportation services as a major metropolitan area.

Key findings and recommendations include:

1. People should be encouraged not to forsake cars but rather to think multi-modally about their trip options. Even eliminating just one auto trip per week will pay dividends to both the individual and the community. Encouraging multi-modalism, even on an incremental basis, provides health benefits, air quality benefits, fuel independence, national security benefits (less foreign oil) and promotes a greater sense of involvement with the community.
2. Provide technological applications (i.e. computer or mobile phone applications) that give users real time choices about multi-modal options. For example, a user would put in some basic trip parameters about a trip from "Point A to Point B "and would immediately be given some choices such as:
    - Taxi: approximate cost ($15), approximate travel time (15 minutes)…text "magic cab" to request a cab to your location.
    - Transit: approximate cost ($2.50), approximate travel time (35 minutes)…text "Bus" to find the closest bus stop and next departure.
    - Rental/Shared Bicycle: approximate cost ($10), approximate travel time (45 minutes)…text "Bike" to find the nearest bicycle rental kiosk
3. Provide real time information about transit delays, traffic delays, hazards, travel specials, etc.[21]

These recommendations are designed to maximize the use of existing resources and/or any new low cost resources. These recommendations help people feel more empowered about their travel choices which in turn makes it much easier to go without a car on a regular basis, and that helps reduce GHG emissions.

RTD already provides a trip planning application on its website and gives passengers mobile or desktop alerts via Twitter and RSS feeds. SJCOG has its Commute Connection program which provides rideshare, traffic alerts and commuter travel tip information. It isn't clear if SJCOG provides any real-time alerts to mobile devices.

The City, RTD and SJCOG might wish to consider combining resources on a next generation program that provides travelers with a "one-stop shop" for all mobile device travel information. The first step could simply be combining the existing applications with a new "front end" device similar to what is used for the San Francisco Bay Area's 511.org page (http://511.org/apps-511-mobile.asp). Beyond that, the program would provide information about locations to rent bicycles, sample walk times and paths, car sharing services, etc. Many of these mobile information components already exist in one form or another but very few metro areas have yet to pull them all together into a comprehensive and easy to use program that can be loaded on most mobile phones.

[21] BART's Mobile Alert System is good example of a real-time alert program (www.bart.gov/alerts)

It's difficult to estimate a cost for creating and maintaining a comprehensive mobile phone alert and travel option program. For planning purposes, if the City decided to pursue this option Nelson\Nygaard would recommend for budget placeholders an initial capital cost of $75,000 and annual program maintenance and marketing costs of $50,000.

Section 6 - Transit Supportive Policies

As noted earlier in this Technical Memorandum, the effectiveness of a transit system is influenced by two primary factors: 1) the design of the system and 2) the environment in which it operates. Transit supportive policies are intended to influence the environment in a way that supports transit and increases its effectiveness. Transit supportive policies and programs cover a broad array of topics, from land use to streetscape standards, housing to bicycling and walking infrastructure, all in an effort to increase transit ridership and decrease Vehicle Miles Traveled (VMT).

Communities with robust transit supportive policies are associated with:

- Increased transit ridership
- More pedestrian trips
- Reduced reliance on automobiles
- Decreased smog-forming and greenhouse gas emissions
- Improved mobility for people of all ages and physical abilities
- More active lifestyles through increased walking or cycling
- Increased housing options
- Reduced household expenses through decreased automobile ownership and use
- Greater opportunities for social interaction

A review of background documents found numerous examples of goals developed by the City of Stockton that already provide a foundation for a robust transit supportive environment. These documents include:

- RTD Coordinated Transportation Plan (2007)
- 2011 Federal Transportation Improvement Program (FTIP)
- The Future of Mobility for San Joaquin County: Balancing Accessibility, Safety and the Environment (2010)
- San Joaquin Council of Governments Regional Transportation Plan (2010)
- Downtown Stockton Strategic Action Plan (2006)
- Stockton Citywide Design Guidelines (2004)
- Stockton Municipal Code, Titles 10 and 16
- Stockton General Plan 2035 (2007)
- City of Stockton Climate Action Plan (In Progress)

- San Joaquin County Regional Blueprint: A Year 2050 Transportation, Land Use, Environmental Vision, SJCOG (2010)

This section focuses on action-oriented guidance for how the city can provide a more transit supportive environment that will help reduce GHG emissions. This section has nine parts describing the essential and applicable characteristics of transit supportive mechanisms.

1. Transit
2. Parking
3. Land Use/Municipal Codes/Growth Management
4. Public Space
5. Building Scale
6. Travel Connections
7. Housing
8. Economic Development
9. Developer Coordination with SJCOG and the CMP

Each of these issue areas are unique, but are sustainable practices when accomplished in tandem with one another. The key to successful implementation is planned prioritization. Creating a transit-friendly environment in the City of Stockton should be the guiding vision, which drives the design for creating comfortable places to walk, bike, shop, sit and live at and near transit facilities. Designing public spaces enjoyable for transit users is a secondary goal. Changing the general perception of downtown Stockton from a “through” or place to be avoided space, to a “to” or exciting place is key to the success of this overall program.

There are two guiding principles used to develop the transit supportive policies and programs in this section: Improving the current environment for transit-dependent riders, and enhancing local and regional transit travel to reduce annual private vehicle miles traveled and subsequent crashes between motor vehicles and pedestrians/bicycle riders. These principles align with the priorities of the Stockton General Plan Settlement Agreement.

Transit

Transit Overlay Zones

The City of Stockton has various overlay zones for historic preservation in the Downtown Commercial District. In order to support and prioritize transit improvements, the City may want to consider adopting transit overlay zones.

In a transit overlay zone, the City would modify the underlying zoning regulations to ensure that development encourages greater transit use and supports efficient transit service. These zones would have directly linked transit incentives (e.g. employer or other sponsored bus passes). New developments, at a minimum, would need to meet existing peak hour transit mode split through the use of Transit Demand Management actions, allowing shared parking use and granting density bonuses for certain uses or developments.

Parking

Parking facilities and parking policies are critical components of effective transit-development. The proper location and sizing of parking facilities are essential if pathways, buildings and public spaces are to succeed in creating transit-supportive settings. Parking strategies include managing on-street spaces, off-street public lots, and private off-street parking in buildings. Several background documents reviewed by Nelson\Nygaard indicated a general perception of

lack of parking in Downtown Stockton. With 16 public parking facilities in the downtown area, the issue may not be a lack of parking but rather a lack of adequate way finding to direct people to the available parking spaces.

Chapter 10 of the Stockton Municipal Code provides direction on parking policies, from residential permit parking, to curb parking restrictions, and parking limits in metered zones.

Chapter 16 of the Stockton Municipal Code, 16.64.060 addresses parking assessment districts. This section provides several key transit-supportive initiatives, including:

> *A. Off-Street Parking Exemption. Whenever public- off-street parking facilities have been established by means of a special parking assessment district, all uses and structures within the district, as established by City Council, shall be exempt from the parking requirements of this chapter if the owners/operators of the uses pay the assessment.*

While there are numerous parking policies and programs to encourage transit, biking and walking over private automobile use, the ideas recommended here are intended to be measured and appropriate given Stockton's context. Once sustainable transit and housing initiatives are in place and the economic downturn has picked up, stronger policies on parking can be developed such as parking pricing to achieve a desired parking occupancy level.

Transit-supportive parking policies for the City of Stockton could include the following:

Parking Requirements

- Reduced parking requirements for residential and commercial uses.

Parking Maximums

- Move zoning/development restrictions from minimums to maximums.

Parking Lots

- Increase Park and Ride lot space to encourage people to leave their cars outside of the Downtown District.
- Increase van sharing programs at Park and Ride locations to fill in gaps in the current transit network.

Parking Pricing

- Unbundled parking - The developer should not "bundle" the price of parking spaces into the price paid by the lessee for building space.
- Parking cash out – Businesses should encourage employees to seek alternative modes of transportation by providing cash allowances rather than parking spaces (see California's Parking Cash-Out Law).

Parking Management

- Parking payment technology – Install municipal meters in parking meter zones 1 and 3 to create one pay station for each block face.
- Fees for parking a single-occupant vehicle should be at market rates for the site's vicinity.

- Set parking fee structure so that cost per hour for short-term parking does not exceed cost per hour for long-term parking.
- Prohibit price reductions for all-day parking (i.e., “Early Bird” specials).
- There should be no discounted or favorable pricing for long-term parking.

Land Use/Municipal Code

Transit supportive land use planning is a policy and design strategy that concentrates a mix of employment, housing, retail and public uses within a comfortable walking distance of transit stops and stations. This strategy is particularly important for encouraging transit use in those areas within a five or ten minute walk of a transit stop or station.

Land use planning, infrastructure and streetscape features that support high quality public transit and which should be further incorporated in the City of Stockton’s General Plan, include:

- Medium to high residential development densities (especially along corridors like Pacific Avenue, Hammer Lane and West Lane)
- Short, continuous street blocks with wide sidewalks
- Parking for retail and commercial developments that is behind buildings, rather than between the buildings and the street
- Mixed-use buildings with minimal setbacks and active ground level land uses
- Building heights and regularly placed street trees that frame the street to give it a comfortable sense of enclosure
- Traffic calming measures and limited surface parking
- Curb cuts and safe crosswalks for universal accessibility
- Bicycle routes with secure bicycle parking facilities

The City of Stockton Municipal Code, Chapter 16 describes development procedures to implement the above recommendations.

> *To support transit-supportive mixed use development, the City may consider amending section 16.24.180 MX (mixed use) zoning district standards from a minimum of 100 acres to lot sizes comparable in the downtown district.*

Public Space

Developing and enhancing public spaces can help encourage people to walk rather than drive to their destination. Creating attractive public spaces around transit facilities, where the transit customer can wait safely and comfortably, helps reduce any stigma associated with using public transportation, and makes public transportation a more competitive mode of travel as compared to other means.

For example, one highlight of the Downtown area is certainly the waterfront, and the developments around the waterfront work together to attract pedestrians. However, the City also has a number of public plazas and parks in the downtown area (e.g. De Carli Plaza and Hunter Square, off of Weber Avenue) which could be prime locations for social gatherings, given some attention and physical upgrades.

Transit-supportive public space and community design policies discourage private vehicle use by providing inviting, pedestrian scale places and streets. The City of Stockton might wish to incorporate the following features and enhancements into its General Plan:

- Pedestrian-friendly streets – streets are by far the most prevalent public spaces; as such, they should be designed to accommodate pedestrians comfortably. Develop features such as street trees, landscaped strips, bicycle lanes or a row of parked cars. The sidewalk itself should also be wide enough to provide a buffer area, with a minimum of 5 feet in less traveled areas and 10 to 15 feet in heavily traveled residential, commercial and office areas.
- Pedestrian-friendly crossings – design crossings to parks and plazas to benefit pedestrians first. This includes pedestrian signals, crosswalks and stop bars, and traffic calming measures such as extending the curb farther into the street, or extending the bus stop area for easy access.
- Quality facilities for transit users – features such as benches, shelters, landscaping and adequate lighting make people feel comfortable while waiting for transit service. The quality of these features is an important part of establishing transit as a respectable and convenient travel option and creating a dignified experience for the transit customer.
- Connection the waterfront with Downtown via unique way finding signage.
- Consistent use of white street lights around public places to create identity.

Building Scale

The Stockton Citywide Design Guidelines provide details on building orientation and site access. Many of these concepts support walkable communities through the development of inviting frontages and safety oriented design. While not traditionally thought of as transit-supportive building policies, the City's effort to incorporate "Crime Prevention Through Environmental Design" (CPTED) mechanisms near residential developments is crucial in revitalizing the downtown core and adjacent neighborhoods. The pertinent strategies of CPTED include:

- Concept of natural surveillance, or "eyes on the street," by promoting features that maximize the visibility of people, parking, and building entrances.
- Concept of territorial reinforcement by promoting features such as landscape plantings, paving designs, and gateway treatments that define property lines and distinguish private space from public space.
- Concept of natural access control by designing streets, walkways, building entrances, and development entries to clearly indicate public routes and to discourage access to private areas.

Sensitivity to the physical design and location of buildings is important in order for travel connections to be attractive. The quality of "out of auto" experiences is influenced by the placement of buildings in relation to the street and other buildings, as well as their height and scale.

Transit-supportive building policies and improvements for the City of Stockton should include:

- As much as possible, human-scale architecture

- Transit supportive design assumes people are willing to walk a maximum of ½ mile for premium transit and rail service and ¼ mile for other bus services. New development policies around these geographic limits should be a focus.
- Policies suggesting buildings and their entrances should be sited along pedestrian walkways. If large parking lots separate buildings from the street, walking is made less convenient.
- Installation of a commuter information center at the Downtown Transit Center and other key destinations.
- Provision of bicycle parking at any new development.

Travel Connections

Providing multiple physical connections empower travelers with the ability to choose how to access a specific destination. Short, convenient connections and pathways located between and within developments make alternative modes of travel more attractive. By integrating uses within a multiple-use activity center, trip distances are shortened and walking or bicycling becomes more attractive.

While Stockton is well connected to regional destinations, travel connections from downtown to neighboring areas, such as the Midtown Neighborhood at the northern end of Downtown and the Gleason Park Neighborhood south of the Crosstown Freeway could be improved. The Downtown core has a pedestrian-scale grid system, making walking to places easy and accessible. However, getting from the downtown to adjacent areas can be difficult because of the physical barriers created by the Stockton Ship Channel, Interstate 5, and Highway 4.

The Weber Avenue corridor is the primary east-west route in Downtown Stockton for pedestrians. Focusing efforts to bolster connections to and through this corridor for pedestrians is essential in creating a vibrant downtown area, and it aligns with the goals of the Weber Avenue Streetscape Beautification Program.

Transit supportive travel connection policies and improvements along this corridor should include:

- Way finding signage listing distances to destinations throughout the corridor.
- Maintaining and installing continuous sidewalks on both sides of Weber Avenue, along with landscaping, street lighting and street furniture (benches) promote walking.
- Encourage bicycling by striping bicycle lanes along the entirety of Weber Avenue and allotting space for bicycle parking throughout the Avenue.
- Enhance north-south connections from Weber Avenue via Lincoln and Stanislaus Streets with way finding signs, sidewalks and bicycle treatments to bring students from the CSUS-Stockton Campus downtown without driving.
- Install an informational kiosk at Weber Avenue and Stanislaus Street to direct pedestrians through the downtown area.
- Focus land use and housing policies and projects for mixed-use development along this corridor and on the spurs leading off of Weber Avenue:
    - Sutter, Hunter and Center Streets for north-south pedestrian movement
    - Lafayette, Main and Channel Streets for east-west pedestrian movement

- Due to the central location of the Ed Coy garage, develop pedestrian way finding signs at the exits to the garage to encourage people to park once and walk to their destinations.

In addition, priority bicycle and pedestrian improvements, as well as transit way finding should be focused along Fremont Street and north of downtown on El Dorado Street, as these streets have the highest densities of zero vehicle households.

Housing

Transit supportive housing policies are critical in supporting and bolstering a vibrant Downtown. Housing options in Downtown Stockton are very limited at this time. The downtown does have a number of single room occupancy (SRO) hotels, which can tarnish the image of Downtown as an attractive place to live.

There are many opportunities to change this environment, and create a more vibrant Downtown.[22] Given the mix of attractions (Convention Center, waterfront, government employment, regional rail service, the Sports Arena, etc) and the downtown's good "bones" (human scale buildings, small blocks, walkable terrain, etc) mixed-use developments and infill housing projects at and near the Transit Center could attract residents to an environment where driving becomes secondary to walking and biking for many short trips.

The city should consider including or enhancing these policies in the General Plan:

- Encourage a diversity of housing prices and accessible residential development in and around transit station areas, through districts, overlay zones, or comprehensive plans.
- Near stations, utilize redevelopment, mixed-use projects and locally designated incentives to stimulate and preserve a broad range of housing choices.
- Support the character and age of the area by locating, designing or maintaining quality housing developments.
- Provide affordable senior and special needs housing where feasible and appropriate.
- Incorporate sidewalks, trails, schools, parks, and other "smart growth" amenities in transit supportive housing.
- Incorporate low maintenance regional landscaping and green building principles when feasible

The City should also look at potential mixed-use housing at and near the City Centre Cinemas as this area is currently a major destination and serves as an anchor for pedestrian activity.

Economic Development

As of 2007, 28,140 residents of San Joaquin County were traveling out of the region for work, a 47% increase from 2000. The mean travel time for San Joaquin County residents was 30.9 minutes, the highest in the State of California.

[22] Nelson\Nygaard does recognize that the City and Regional economies will need to stabilize and return to a growth mode before much can happen in terms of new development downtown. Economic recovery is likely several years in the future.

Revitalizing Downtown Stockton is central to reducing overall commute times and strengthening employment opportunities. The City should consider including or enhancing the following polices in the General Plan:

- Use Downtown Financial Incentive Program funds to support the development of transit station area plans that encourage transit-supportive development or redevelopment.[23]
- Seek Federal Transit Administration (FTA) "New Start" monies to upgrade bus stops.
- Encourage public-private partnerships that use development incentives as a means of achieving transit-oriented development and economic development goals.
- Encourage businesses to apply for the Facade Grant Program.
- Provide incentives to developers to purchase and convert an appropriate level of SROs to mixed-use housing
- Create overlay districts, like the Arts and Cultural District, to encourage local groups to start public facilities downtown
- Work with local institutes of higher education to bring satellite campuses to Downtown.

Developer Coordination with SJCOG and the CMP

The City of Stockton will work with and encourage applicants for all large development projects to coordinate with SJCOG on Congestion Management Programs (e.g., Commute Connection, Regional TDM Action Plan, SJVAPCD 9410 Program) in order to:

- Mitigate their impact on the transportation system and
- Help implement strategies that will decrease SOV trips and increase use of public transit and other non-SOV mobility options.

[23] The City of Stockton offers a program to reduce or eliminate building permit and associated public facilities fees for many downtown projects. If the project rehabilitates an existing downtown building that has been vacant for six (6) months or longer, most permit fees will be waived. Demolitions, new construction, or expansions do not qualify.

Section 7 – Funding Strategies

The purpose of this section is to identify potential revenue sources that could be used to pay for costs associated with proposed enhanced RTD services and/or to support other forms of sustainable transportation in the City of Stockton over the next decade.

This section begins with a review of RTD's current funding sources. Next is a discussion of opportunities to increase funding by maximizing existing sources where possible and securing new revenues, through traditional and non-traditional avenues. The final segment outlines a recommended financial strategy for RTD and the City of Stockton. Based on the relatively long list of possible revenue sources, they are narrowed down to those that have the most promising potential for short-term success. Funding mechanisms that could provide stable ongoing support for RTD and other sustainable forms of transportation are recommended as a longer-term strategy with steps to initiate them in the near future.

Since the funding arena is both complex and requires a long-lead time for many revenue sources, it is important to develop a strategy to initiate enhanced services over the next several years while positioning RTD and the City to develop a longer-term funding strategy to provide operating subsidies and secure revenues to support capital investments.

When evaluating the potential for new revenue sources, the obvious question arises: "how much money is needed?" The answer is a complex one and depends upon the type and level of service that is ultimately provided. The transit program described in Section 2 will require a minimum of $4 million per year for operations plus several million more for capital purchases. The Car Sharing program in Section 3 could require several hundred thousand dollars per year. The Transit Supportive Policies in Section 4 do not have any costs associated with them at this time.

RTD Funding

RTD's existing revenues are needed to maintain its current family of services. As noted in its 2008-2013 Short Range Transit Plan (SRTP), service levels are projected to remain relatively constant in the next five years due to constrained funding. Without an influx of new funds, it will not be possible for RTD to increase service levels or introduce new types of service or increase frequencies in key ridership corridors.

Existing Funding Sources

The funds RTD currently uses to support existing service and capital investments are listed in Figure 14.

Figure 14 Existing RTD Funding Sources

Program Fund Source	Funding Purpose	Use of Funds	Comments
FEDERAL			
FTA Section 5307 Urbanized Formula Funds	Provides funds for transit capital projects in urbanized areas over 200,000 in population and for small urbanized areas between 50,000-200,000 in population provides for transit-related operating costs.	RTD uses Section 5307 its formula funding apportionments for both capital and preventative maintenance with a minimum of 1% for security projects.	The availability of funds for capital use is subject to local prioritization and project selection at the regional level through SJCOG.
FTA Section 5309 Capital Program (Congressional Earmarks)	Provides Federal funds for bus and bus facilities and New Rail Starts	RTD uses Section 5309 funding for vehicle fleet replacement (FY 11 and beyond)	There is no guarantee of 5309 discretionary funds beyond FY 2012.
Congestion Mitigation/Air Quality (CMAQ)	CMAQ funding is available to metropolitan areas that are not in compliance with federal air quality standards regarding ozone or carbon monoxide.	Through San Joaquin COG, RTD uses CMAQ funds to purchase vehicles that have fewer emissions. RTD anticipates using additional CMAQ funds for bus replacement as they become available.	CMAQ funds are administered through the San Joaquin Council of Governments (SJCOG) and are awarded on a competitive basis.
FTA Section 5311	The FTA 5311 program provides formula funding in areas of less than 50,000 populations. Funds may be used for capital, operating and administrative assistance.	RTD uses 5311 funds to support Hopper and Intercity operations in the rural portion of San Joaquin County.	RTD is a recipient of both FTA 5307 and 5311 funds.
FTA Section 5311 (f)	Subset of 5311 which are set aside for assistance in starting Intercity services between rural areas and urban centers.	RTD uses 5311 (f) funding for capital fleet replacement for Hopper and Intercity buses	
FTA Section 5316 Job Access and Reverse Commute (JARC) Program	The purpose of the JARC program is to fund local programs that offer job access services for low-income individuals.	RTD uses 5316 funding for operating assistance and education assistance programs.	
FTA Section 5317 (New Freedom Program)	This funding program is intended to reduce barriers to transportations services and expand the transportation mobility options available to people with disabilities beyond the requirements of the ADA 0f 1990.	RTD uses 5317 funding for operating assistance and education assistance programs	
STATE FUNDS/REGIONAL			
Proposition 1B - Public Transportation Modernization, Improvement and Service Enhancement Account (PTMISEA)	Capital infrastructure improvements for transportation related projects.	RTD has secured $11 million for Phase I of the Regional Transportation Center, bus procurements and facilities improvements.	RTD has programmed Prop 1B funding for other bus procurement and facilities improvements although no funds are committed beyond the $11 million.
LOCAL			
Transportation Development Act (TDA): Local Transportation Fund	The Local Transportation Fund revenues are derived from a one-quarter cent sales tax, which is collected by the Board of Equalization, and administered locally through the San Joaquin COB who returns it to local jurisdictions on a population basis.	TDA Funds can be used for transit if there are no “unmet transit needs” reasonable to meet. Stockton contributes 100% of its TDA funds toward transit; the County contributes approximately 76%.	These funds are used for both capital and operating assistance.
State Transit Assistance (STA) Funds	These are funds dedicated exclusively for transit purposes.	STA Funds are used to support operations and match to capital projects.	In 2010, the Governor eliminated State Transit Assistance (STA) funds, however there were legal challenges and based on a “Gas tax swop” STA funds were re-instated but at reduced levels.

The primary existing funding sources are Federal Transit Administration (FTA) Section 5307, TDA Article 4 and Measure K. Formula funds are projected to remain constant or even decline in the short term. Revenues that are derived from sales tax receipts fluctuate and are currently depressed and are projected to remain so in the near future. Discretionary funds are competitive and are not guaranteed and tend to be used for capital improvement projects. No new federal or state funds are anticipated even with reauthorization of the new federal transportation bill expected in 2011. In this current economic climate of fiscal austerity it is challenging for RTD to fund its current operations and planned capital improvement projects. For this reason, new funding sources are needed for RTD to pay for enhanced transit services and other forms of sustainable transportation described in the previous sections.

Potential Funding Opportunities

Potential funding sources that RTD and/or the City of Stockton can use to supplement transit service or transit programs are summarized in Figure 15 and described below. Some of the funds reflect existing sources RTD currently uses that present opportunities for additional grant opportunities and others are new revenue sources that RTD and the City of Stockton are currently exploring or represent new sources not previously considered.

Figure 15 Potential Funding Opportunities

Program Fund Source	Funding Purpose	Allowable Use of Funds	Applicability for Transit Enhancement Strategies	Comments
Federal Fund Sources				
FTA Section 5309 Capital Program (Congressional Earmarks)	Provides Federal funds for bus and bus facilities and New Rail Starts	Transit capital projects	Potential for funding replacement vehicles, the Regional Center and future BRT Phases.	Work with Congressional delegation to secure federal funding or high priority large-scale capital projects in the next transportation bill (2011). Projects may be positioned to receive "earmarks" in the next funding cycle if they are high profile and have local and regional support.
Congestion Mitigation/Air Quality (CMAQ)	Federal funding program that is typically limited to purchase of clean fuel buses	Transit capital projects	Good potential for replacing hybrid diesel-electric vehicles	These funds are highly competitive.
FTA Section 5311(f)	Federal funding program for intercity services	Capital and operations	Potential for enhancing intercity services	Since RTD is a recipient of these funds and uses them for Hopper and intercity service, it may be challenging to secure additional funding.
TIGGER (Recovery Act)	Federal funding program for transit agencies pursuing projects to reduce energy consumption or greenhouse gas emissions.	Capital projects only	Potential for vehicle replacements or other capital Infrastructure improvement.	This program was part of the 2009 American Recovery and Reinvestment Act. It is unclear if this program will be part of a reauthorization of the Federal Transportation Act.

State, Regional and Local Fund Sources				
Safe Routes to School Grant Funding Program.	Projects to increase safety and accessibility for students to use sustainable forms of transportation to get to school.	Capital projects only	Funds could be used to pay for infrastructure improvements	RTD could partner with school districts and submit a SRTS grant application for infrastructure and other related improvements.
Public Transportation Modernization, Improvement and Service Enhancement Account (PTMISEA)	Projects are for reducing congestion, and protecting the environment.	Transit capital projects	Funds could be used to pay for replacement vehicles and infrastructure improvements.	Funds have been secured for Phase I the Regional Transportation Center.
San Joaquin Valley Air District: Rule 9410, "Employer Based Trip Reduction" aka "eTRIP Rule"	To reduce vehicle miles traveled from private vehicles used by employees to commute to and from their worksites.	Variety of programs including outreach, transit subsidies, compressed work weeks, etc.	Section 3.16 suggests employer subsidies for transit passes.	This is a phased program where employers must implement eTRIP programs consisting of the trip-reduction strategies. Only employers with 100+ employees are required to participate in this program. RTD is interested in developing a mechanism for employer's to purchase bulk passes to assist them in meeting the requirements of this rule.
Measure K	The San Joaquin County ½ sales tax initiative was approved by voters in 1990 and has been extended through 2040.	Used for a variety of capital projects and programs to improved transportation throughout the County.	Funds have been requested for the Regional Transportation Center, signal preemption equipment and other bus and bus facility equipment.	It is in RTD's best interest to maximize its allocation of Measure K funds which can then be sued to support both capital improvements projects and operations. This flexible fund source is critical for RTD's ability to enhance transit services.
Central Parking District	Funds generated by the operation of parking facilities and ad valorem taxes on	Revenues collected from the City's seven owned lots are used mainly to operate and maintain them.	If fees were increased, it is possible that revenues could be used to help support transit in the immediate vicinity.	It may be challenging to raise parking fees during the economic downturn.
SJCOG Regional Transportation Impact Fee	This is a one-time fee on new residential and non-residential development to mitigate impacts from increased congestion and complete substantial improvements.	Transit and Roadway Improvement Capital Programs	Could be used to help pay for new buses or bus stop improvements	Depending upon the rate of new development approvals, this could be a good source of funds for new transit capital projects, especially those linked to infrastructure improvements along major corridors.

RTD taxing authority (existing parcel tax or new sales tax		Revenues can be used for any allowable purpose under the enabling legislation.	RTD can increase its tax level but only with voter approval.	RTD should consider going to the voters to request approval to increase the parcel tax with the hope of raising several million more dollars per year.
City of Stockton Transportation Impact Fee	Development impact fees are assessed by city, county, or regional governments on new development in order to pay for the increased services and new infrastructure necessary to serve new trips.	Primarily capital projects; also operations in some situations	The existing Traffic Impact Fee would have to be modified to include multimodal improvements, such as increased transit service.	Alternatively, a Transit Impact Fee could be established in downtown Stockton. The fee must demonstrate a "rational nexus" between the impact of the project and the fee charged.
City of Stockton Air Quality Mitigation Fee	Provides a uniform and consistent program to reduce and partially offset the air quality impacts of future development in the City.	The fees collected through the program are used to fund programs and activities that are not easily implemented through development conditions or mitigation measures on a project by project basis.	Currently used to support carpooling and improvements to central traffic controls	Could be expanded to help fund new BRT routes that help the city lower GHG emissions.
Private Sector Sources				
Business Improvement District (BID)	BIDs provide a means for businesses to assess themselves to improve the surrounding area. A property-based improvement district (PBID) collects money from property owners rather than business owners.	Funds collected by BIDs are typically used to fund facility improvements and other transportation enhancements.	Once established, the District could advance public/private funding for any strategy provided it benefits residents or visitors within the District boundaries.	Business owners often initiate the process to establish a BID. However a City Council resolution must establish the intent and activities of the BID and its proposed boundaries.
Public/Private Partnerships	Public/private partnerships can increase overall funding by leveraging "outside" dollars and is mutually beneficial to both parties.	Flexible	Support operations and/or pay for capital improvements	Examples of public/private partnerships are presented for universities colleges, retailers and employers. These include a U-Pass Program and Eco Pass. Other possibilities include hospitals, and other institutions.

Retail and Merchant Contributions	Retailers may share in the cost of transportation improvements especially if one-time capital improvements or contributions.	Flexible	Primarily capital projects; also operations in some situations	May require agreement between RTD and private interests - – public/private partnerships.
Employer Contributions	Employers may share in the cost of transportation improvements if beneficial to their employees.	Flexible	Primarily capital projects; also operations especially with Rule 9410	Employers sometimes are willing to underwrite transportation to support their workers getting to/from worksite. May requires agreement between City and employers – public/private partnerships.

Federal Fund Opportunities

Federal Transit Administration (FTA) 5309

Capital projects such as transit centers, new starts and large bus purchases are often partially funded with federal discretionary funds from the Section 5309 Discretionary funding program. These funds are often "earmarked", either in the federal transportation funding legislation (which has been extended and is currently being reauthorized) or in annual appropriations of any unobligated balances. Working with the local congressional delegation high priority local and regional projects could potentially be funded with this federal program in the upcoming new federal bill. Funding requests for projects must be consistent with the local Transportation Improvement Program and the State Transportation Improvement Program. Section 5309 funds must be matched by state and local funds.

FTA Small Starts

RTD has benefited from the FTA Small Starts, Very Small Starts and Livability programs for the Metro Express Airport Corridor and Metro Express Hammer Lane expansion projects. New Starts funding is not guaranteed. RTD could continue to apply for additional grant funding for other corridor projects such as Hammer Lane.

These grants are highly competitive and projects are evaluated based on the following criteria and weights:

- Cost-effectiveness, one-third;
- Transit-supportive land use, one-third; and
- Economic development effects, one-third

While larger projects require that a number of alternatives be considered in an alternatives analysis to assess the numerous tradeoffs in costs, benefits, and impacts, the consideration of Small Starts often implies that fewer useful alternatives exist and in some cases, there may only be two alternatives, one representing the Small Start and the other today's service levels. Nevertheless, the number of alternatives considered must continue to meet the environmental requirements, good planning practices, and proper identification of project costs and benefits for funding recommendations.

Congestion Mitigation and Air Quality (CMAQ)

The program, authorized through the current federal transportation legislation, is available to metropolitan areas that are not in compliance with federal air quality standards regarding ozone or carbon monoxide. These funds are administered locally by SJCOG. RTD has benefited from CMAQ funding for vehicle replacements. In future years, RTD has programmed CMAQ funds in its draft Capital Improvement Program to replace revenue and non-revenue vehicles including gas-electric powered vehicles. Since CMAQ is not formula based or guaranteed, RTD needs to continue to apply for these competitively awarded funds.

FTA Section 5311(f)

Fifteen percent of the Section 5311 apportionment is for the Intercity Bus Program, known as Section 5311(f). The Intercity Bus Program funds public transit projects that serve intercity travel needs in non-urbanized areas. Projects are awarded on a statewide competitive basis. This program funds operating and capital costs, as well as planning for service.

RTD uses these funds to help support the Hopper and intercity service including vehicle replacements. Although highly competitive, RTD could apply for additional 5311(f) funds in future years.

Safe Routes to School (SRTS) Grant Funding Program

This program funds projects that increase the number and safety of children reaching school by walking and biking. It funds capital projects such as sidewalk improvements, traffic calming and pedestrian/bicycle crossing improvements, on-street bicycle facilities, off-street bicycle/pedestrian facilities, and traffic diversion improvements. Federal SRTS funds may be used by state, local, and regional agencies as well as non-profit organizations, school districts, public health departments; however these groups must partner with a city, county, MPO, or RTPA to serve as the responsible agency for a project. Federal funds may be used for infrastructure improvements as well as other small scale enhancements.

Through this program there is an opportunity for RTD to apply for SRTS funding to enhance pedestrian and bicycle facilities as well as means of enhancing students to ride transit to school.

State, Regional and Local Funds

Proposition 1B

Proposition 1B, also known as Public Transportation Modernization, Improvement and Service Enhancement Account (PTMISEA) was approved by voters as Proposition 1B on November 7, 2006. Passage of the Proposition allowed the State of California to see bonds for capital infrastructure improvements for transportation related projects. They are intended to advance the State's policy goals of providing mobility choices for all residents, reducing congestion, and protecting the environment.

San Joaquin Valley Air District

Rule 9410- “Employer Based Trip Reduction” – The purpose of the rule (e Trip Rule), adopted December, 2009 is to reduce Vehicle Miles Traveled (VMT) by employees to and from the worksite through employer-based reduction measures. This rule outlines a number of employer-based measures to reduce employee trips ranging from incentivizing employees to stay on campus for lunch breaks etc., to compressed work weeks reducing the number of days an

employee must travel into the office and other programs to increase bicycle and transit use. The most relevant measure for increasing RTD ridership is transit subsidies provided by employers to employees. This rule only applies to employers with at least 100 employees in cities that meet specific criteria. The City of Stockton is an incorporated city with greater than 10,000 residents and therefore meets the criteria for this rule.

The eTRIP is phased in over a period of three years. Phase 1 includes "Marketing" and "Program Support" strategies to increase program awareness to make ridesharing and alternative transportation easier for employees. The Phase 2 "Services and Facilities" strategy includes measures deployed in the workplace so that employees are less likely to need to travel offsite for personal business during the workday. Phase 3, "Transportation, Alternative Schedules, and Incentives," includes a wide range of options such as comprehensive carpool and vanpool programs, monetary incentives for ridesharing, subsidized transit passes, and telecommuting.

Measure K

Measure K is the voter approved initiative approved by voters in 1990 with the purpose of improving roads, public transit, and air quality. Measure K funds are administered and distributed by SJCOG. The program will expire in 2040 and is estimated to distribute over $2.5 billion in funding over the next 30 years.

Measure K provides significant operating subsidies for Hopper, Intercity and Interregional Commuter Services. Measure K sales tax revenue projections are depressed for the next several years resulting in a reduction in RTD operating support. RTD has requested Measure K funding for capital projects including the Regional Transportation Center, signal preemption equipment and other bus and bus facility equipment. The SJCOG Board is expected to act on these funding requests in June 2011. RTD has aggressively pursued additional Measure K funding and is encouraged to do so to maximize these funds.

City of Stockton Central Parking District (CPD)

The City of Stockton's Central Parking District administers the City's surface lots and parking structures in the Downtown area of Stockton. Capital improvements, maintenance and operating expenses are funded by an ad valorem assessment on all property located within the District. The maximum monthly rate is $73 and the hourly rate is $2 per hour or $5 per day in some locations. Our understanding is that there is a wait-list for monthly parking passes suggesting that there is opportunity to raise the price of parking permits. A modest increase would generate additional revenue for the city and potentially influence drivers to switch to another mode of travel. Additional revenues could be used to supplement transit service and other forms of sustainable transportation in the area.

RTD Tax Authority

RTD's enabling legislation states:

> *The District may levy, and collect or cause to be collected, taxes for any lawful purpose subject to a maximum limit of five cents ($.05) per one hundred dollars ($100) of assessed value of all real estate and personal property; provided however, the district shall have the further power to levy, collect or cause to be collected said property taxes to a maximum limit of ten cents ($.10) if approval is first obtained from the City Council of the City of Stockton and the Board of Supervisors of the County of San Joaquin.*

According to RTD's legal counsel, this legislation was superseded in 1978 by Proposition 13.[24] RTD currently collects approximately $900,000 per year[25]from a parcel tax set at 1.5%. It might be possible to increase this taxation level but only if RTD puts the increase on the ballot for voter approval per Proposition 218.[26] Nelson\Nygaard does believe that this is a funding opportunity which should be explored.

SJCOG Regional Transportation Impact Fee

This is a one-time fee on new residential and non-residential development for mitigating the impacts from increased traffic congestion. The maximum fees for development types are shown below:

- $2,512 per single-family unit
- $1,542 per multifamily unit
- $4.65 per retail square foot
- $2.13 per commercial/industrial square foot

The fees collected in this program may be used for road and transit capital projects. Some of these fees are currently being allocated to help fund the purchase of new buses for the RTD Rapid Bus Program.

City of Stockton Impact Fees

Impact fees are levied on new development based on reasonable relationships between the amount of the fee, the type of land use paying the fee, and the benefits received from the facilities funded by the fee. Impact fees may be citywide or for sub-areas. The City of Stockton has a citywide traffic impact fee that is currently exempt in the downtown area because of the economic downturn. The fee is based on vehicle level of service standards (LOS) and is referred to as a "Public Facility fee." It only allows revenues to be used for streets/roads improvements that are intended to mitigate the impacts due to new development.

An alternative impact fee is a Transit Impact Development fee. San Francisco is one of the few cities in the country to have a development fee dedicated to transit and the only city in the country to have a fee dedicated to capturing the impact of new development on both transit capital and operating costs. Where other cities have established fees that support a variety of modes, contributions to public transit are generally limited to a relatively finite set of capital expenditures.

The Transit Impact Development Fee ("TIDF") was initially enacted in 1981 and then updated in 2004. The 2004 update significantly revised the nexus analysis for the TIDF, tying the creation of new transit or auto trips to an impact on transit service. It also expanded the fee from one that was levied only on office uses in the greater downtown area to one that is levied on all non-residential uses citywide. The 2004 ordinance allows for the fee rates, initially set at $8 and $10 per square foot of new development depending on the type of land use, to be increased biennially for inflation.

[24] http://www.californiataxdata.com/pdf/Prop13.pdf

[25] Source - RTD SRTP.

[26] Source: email from RTD staff 6/28/11

The fee has generated over $100 Million in collections and about $48 million in interest income for Muni operations since its inception. Fee proceeds can be used only for peak period capacity increases, above the service that was provided in 1981, on lines that serve the TIDF area. The fee nexus is based on the assumption that new office developments pose a unique burden on Muni service by adding peak period employee trips that cannot be accommodated on existing lines.

City of Stockton Air Quality Mitigation Fee

The City of Stockton Air Quality Mitigation Fee Program is designed to provide a uniform and consistent program to reduce and partially offset the air quality impacts of future development in the City. The fees collected through the program are used to fund programs and activities that are not easily implemented through development conditions or mitigation measures on a project by project basis. The program currently pays for:

- Car pool coordination activities
- Extension of the central traffic signal control computer and associated fiber optic network to provide communication between traffic signals and central computer including but not limited to:
  - Fiber optic communication line extensions and equipment (Ethernet switches, end equipment)
  - Traffic Monitoring video cameras / modems

The city might wish to expand this program and use the additional fees to help fund BRT services which in turn will help the city reduce its total GHG emissions.

Public/Private Partnership Funding Opportunities

Transit services are increasingly turning to the private sector to help fund transit services. Successful models consist of public/private partnerships in which a public transit agency and the private sector cooperate and enter into an agreement to help pay for transit services. Financial contributions could take the form of ongoing operating support, subsidizing passenger fares by offering reduced pass prices or could also be used for one-time capital purchases such as passenger shelters. The private sector can be broadly interpreted to include employers, merchants and retail establishments. Private sector contributions could also consist of development impact fees (described below). Employers or merchants that benefit from a route that directly serves their patrons or employees or clients may be interested in supporting it particularly if a bus stop were located at their front door to maximize convenience for their employees or customers.

RTD-College U-Pass Program

There are several examples of partnerships between universities and transit agencies that are structured to encourage transit ridership, and to help pay for supplemental services designed for university students, faculty and staff. Two successful examples are described below.

- University of California at Santa Cruz (USCS) - has a formal agreement with the Santa Cruz METRO transit agency that allows students to ride any Santa Cruz METRO bus free of charge. Students must simply display a UCSC ID card with valid sticker to the driver to board the bus. Drivers manually count student and faculty boardings, and the university is then invoiced monthly for $1.21 a ride (normal fare is $1.50). Students are assessed a

quarterly transit fee of $110 as part of their tuition, which was approved by student referendum. Faculty and staff must purchase a transit pass for $110 from the university.

- Due to parking constraints, and the environmental goals of the university, alternative transportation is strongly encouraged by Chico State University. Chico State University currently has a formal contract with Butte Regional Transit or "B-Line" to provide free bus transit to students, faculty, and staff, which represent close to 25% of overall system ridership. Under this agreement, those with valid Chico State ID Cards are allowed to board B-Line buses for free after swiping cards through a fare box scanner. The fare boxes record and total the number of free boardings, allowing B-Line to send the university an annual invoice. The university's student association is responsible for a portion of the cost, while the university itself covers the remainder through student fees. The regular fare for local transit service is $1.40, while the student (K-12) fare is $1.00. However, Chico State is invoiced only $0.82 per boarding, creating a significant discount for the university and increasing overall ridership for B-Line. Over 6,600 different unique university IDs were recorded during the 2008/09 fiscal year, indicating that close to 40% of Chico State students utilized the free service.

RTD has approved the discounted sales of volume Student and Adult monthly passes in an attempt to establish public/private partnerships with local businesses and educational institutions. Excellent opportunities exist with local education institutions including San Joaquin Delta College, California State University Stanislaus, and the University of the Pacific. As stated in the 2009 – 2013 SRTP, RTD has established a partnership with the San Joaquin Delta College for the purchase and resale of volume student monthly passes. Information about college campuses and parking information is presented in Figure 16.

Universal Transit Passes

In recent years, growing numbers of transit agencies have teamed with universities, employers, or residential neighborhoods to provide universal transit passes. These passes typically provide unlimited rides on local or regional transit providers for low monthly fees, often absorbed entirely by the employer, school, or developers.

The principle of employee or residential transit passes is similar to that of group insurance plans – transit agencies can offer deep bulk discounts when selling passes to a large group, with universal enrollment, on the basis that not all those offered the pass will actually use them regularly. Universal transit passes provide multiple benefits, as discussed below:

For transit riders

- Reduced of free access to transit
- Rewards existing riders, attracts new ones

For transit operators

- Provides a stable source of income
- Increases transit ridership, helping to meet agency ridership goals
- Can help improve cost recovery, reduce agency subsidy, and/or fund service improvements

For communities

- Reduces traffic congestion and increases transit ridership
- Reduces existing parking demand: For example, Santa Clara County's ECO Pass program resulted in a 19% reduction in parking demand
- Reduces unmet parking demand

For developers

- Universal transit pass programs can benefit developers if implemented concurrently with reduced parking requirements, which consequently lower construction costs
- Providing reduced or free transit passes for large developments provides an amenity that can help attract renters or home buyers as part of a lifestyle marketing campaign appealing to those seeking a "new urban lifestyle"

For employees/employers

- Reduces demand for parking on-site
- Provides a tax-advantaged transportation benefit that can help recruit and retain employees

Figure 16 Campus and Parking Information

Educational Institution	Number of Students	Parking on Campus?	Daily charge for parking on campus
University of the Pacific	4,806 (Stockton Campus)	Yes – Some free lots. Others are permit regulated	Annual permits range from $50-$150 depending upon school affiliation and where the student lives. Temporary permits for visitors are free
San Joaquin Delta College	23,000	Yes – There are 20 lots with a combined total of 5,000 spaces	$1/day for a daily permit.
CSU Stanislaus	8,305	Yes – Total amount of parking unknown at this time.	The daily fee ranges between $3 and $6 depending upon the parking lot. Monthly permits range from $12 to $76.60 depending upon school affiliation and location of the lot, and whether it is a reserved space.
Humphreys College	1,172	Yes, but amount is unknown at this time.	No information available at this time.

With four college and universities in the area, excellent opportunities exist for RTD to formalize arrangements with these educational institutions.[27] Partnerships between public transit systems and universities are beneficial to both the universities and the transit agencies as a way to increase transit ridership and offer services to students, faculty, and staff at a discounted fare. Entering into formal written agreements is an effective method of structuring these partnerships to ensure the transit agency is getting its "fair share" of revenue and those affiliated with the local university are receiving good service and a discounted fare. Research indicates that "agencies that serve major universities tend to have significantly higher per capita ridership figures than do other comparably sized areas" and that the specific routes serving a campus are often the most heavily patronized.

The most common arrangement is that students, faculty, and staff are able to board public transit buses free of charge, after either presenting a valid university ID card to a driver or swiping it though a farebox. The university is then either invoiced directly by the transit agency based on the number of boardings, or makes an annual payment to the transit agency based on multi-year ridership averages. To cover costs incurred by the university, a student transit fee is charged as part of regular tuition or other fees.

Financial arrangements such as these are beneficial to both universities and transit agencies. By ensuring the ease of transit use for those affiliated with universities, transit agencies are able to substantially increase ridership throughout their system. Students, faculty, and staff of the universities will benefit from unlimited rides for an overall reduced fare payment. The universities themselves benefit from reduced automobile congestion, less overcrowding of limited parking facilities, and decreased automobile emissions to further university environmental goals.

[27] RTD is exploring opportunities for Universal Transit Pass and U-Pass Programs as part of its on-going Fare Structure and Policy Study. The expected completion date of this study is late summer 2011.

Assessment Districts

Assessments districts are authorized under the Mello-Roos Act of 1982. Local jurisdictions may form a district and levy a special tax after a 2/3 vote of the property owners. A Mello-Roos special tax provides more flexibility than an impact fee because it does not require that the levy be linked to benefits received. The taxes may be used to fund a wide variety of infrastructure needs including transit. The revenues can be used for maintenance and operations.

Assessments are imposed on properties to pay for public facilities or maintenance of public facilities that provide special benefit to those properties. Assessments may be citywide or for sub-areas. California law includes several statutory authorities under which local jurisdictions may establish an assessment district. Subject to review by legal counsel, the Municipal Improvement Act of 1913 (Calif. Govt. Code §10000 et seq.) would appear to provide sufficient authority for creation of an assessment district to fund transit facilities and operations (see §10100.5 and §10100.8)

In addition to a business improvement district, another option is a Community Facilities District (CFD). A CFD may be created by cities, counties or school districts to generate revenue for improvements through the use of a special property tax. The sale of public bonds is used to secure funding for infrastructure and service improvements. The taxation rate varies greatly between CFDs and cannot be generated in relation to property value but rather based on an equation which considers property characteristics such as lot size and square footage of the structure. While most examples do not specifically mention transit service or infrastructure improvements made with this funding source, they do not seem to be prohibited.

Bus Stop Sponsorships

Although not necessarily a large revenue generator, RTD could consider sponsorships at bus stops and even on buses. As an example, the Portland Streetcar, which began operations 2001, has a major private sector sponsorship program that generates approximately $250,000 per year for its vehicle and bus stop sign sponsors. For bus stop signs, businesses pay $500 per month for each stop ($750.00 per month for two). In return, the business has their name posted at each end of the shelter, an audible announcement of the business over the Streetcar communication system at the sponsored stop location(s) as well as their name printed on brochures.

Fare Policy Changes

Raising fares is always an option for increasing revenues. Fares should be raised periodically to keep pace with the inflation rate. RTD must meet its state mandated farebox recovery ratio of 20% for 10% and thus must regularly increase fares to maintain these averages. Raising fares is often a last resort, and increasing them faster than the rate of inflation has the potential to have negative impacts, particularly on the transit dependent population which has few alternatives to transit. RTD should balance the revenue raising potential of increasing fares against the likelihood that a decrease in ridership will result, at least in the short term.

Section 8 – Action Plan

The table in Figure 17 summarizes the major action items listed throughout the document. Some of the items relate to an on-going RTD Fare Study which will not be completed for another few months. More detailed information will be available at that time.

Each item is assigned to a category and includes a general description, a recommendation for responsible party or parties, an implementation period and if applicable, estimated costs.

As the City of Stockton and the RTD move forward with their respective implementation activities, they should remember that there are already several adopted goals and objectives in the 2035 General Plan which specifically support coordination efforts between the two entities. These include:

- Transportation is both a local and a regional issue. Effective improvements to the transportation system depend on the multijurisdictional cooperative efforts of multiple agencies beyond the City of Stockton, such as the State of California, the San Joaquin Council of Governments, San Joaquin County, the San Joaquin Regional Transit District, and adjacent cities.[28]

- The City shall work with the County, SJCOG, Caltrans, SJRTD, and other jurisdictions and agencies to secure additional funding to meet transportation funding shortfalls for priority projects and other modes of transportation (e.g., bike and transit).[29]

- The City of Stockton is looking for the General Plan to facilitate an effective and efficient alternative to the City's current reliance on the automobile. The policies under this goal cover topics ranging from the integration of transit into the transportation network to the clustering of land use necessary to make these options a reality. A significant new feature in the transit framework of Stockton's future is the establishment of a BRT concept. The proposed BRT system will provide convenient access and integration of both new development areas (villages) and existing neighborhoods within the City (districts).

- The City shall work cooperatively with the San Joaquin Regional Transit District, the Altamont Commuter Express, the San Joaquin Council of Governments, Bay Area Rapid Transit (BART), Caltrans, AMTRAK, and other public transit providers to provide rail and bus service at a level that offers an alternative to the automobile for both the short and long distance commuter, and provides basic transportation to work, shopping and other destinations, especially for the handicapped, elderly, youth and economically disadvantaged.[30]

- The City shall support efforts to develop bus rapid transit (BRT) within and beyond Stockton.[31]

[28] Source: Stockton General Plan 2035 (pg 8-1)

[29] Source: Stockton General Plan 2035 (pg 8-4)

[30] Source: Stockton General Plan 2035 (pg 8-16)

[31] Source: Stockton General Plan 2035 (pg 8-17)

Figure 17 Action Plan

Category	Action Item	Description	Responsible Entity	Timeline	Cost (Capital, Operating or Both)	Potential Funding Sources (Best Opportunities)
Last Mile Barriers	Peer to Peer Car Sharing Program (stand-alone or built upon SJCOG's Commute Connection)	Implement a car sharing program amongst residents in key neighborhoods	City of Stockton & SJCOG	FY 2014/15	Low cost program for the city. Annual marketing < $20,000 Website development < $10,000 Neighborhood Surveys <$30,000	Transportation Impact Fees City of Stockton AQ Mit. Fees Public Private Partnerships
Last Mile Barriers	Multi-modal Information Program	Implement a new comprehensive multi-modal traveler information program for mobile devices and desktop computers	City of Stockton & SJCOG & RTD	FY 2012/13	Initial start up and maintenance costs need to be further refined. Capital Cost Software - $75,000 Annual marketing and upkeep - $50,000	Measure K San Joaquin Valley AD eTrips
Transit Supportive Policies	Implement a variety of new policies and programs to support transit services and multi-modalism[32]	1. Create Transit Overlay Zones 2. Reduce parking requirements for residential and commercial uses 3. Recommend to project applicants that they maximize project densities, especially along transit corridors or within Transit Oriented Developments 4. Increase space allocated throughout the city to Park and Ride Lots 5. Increase van sharing programs 6. "Unbundle" parking for developers 7. Create a parking cash-out program 8. Install municipal parking meters and a pay station in Zones 1 & 3 9. Charge market rates for parking 10. Encourage medium to high density development along Pacific, Hammer, West corridors 11. Require commercial/retail parking be moved behind buildings for new developments 12. Create or expand upon ped-friendly streets, crossings and transit facilities 13. Improve way finding signage between downtown and waterfront 14. Orient development and building layouts to recognize "1/4 mile" walk to transit rule of thumb. 15. Treat Weber/Miner streets as downtown corridors needing special, priority attention for housing, transit, ped, bike and safety improvements 16. Incorporate a "multi-modal" approach into assessment process for all new developments (i.e. does it work with	City of Stockton & RTD (for transit items)	Phased in between 2013 and 2020	Further analysis is needed to determine costs of the various programs	Measure K San Joaquin Valley AD eTrips Business Improvement District Central Parking District

[32] See section 5 for details on all proposed policies

		transit, ped, bike and cars?) 17. Seek Downtown Development Incentive Program funds and allocate them to development around transit 18. Seek FTA “New Starts” to upgrade bus stops 19. Encourage business to apply for Facade Grant Program 20. Provide incentives to developers to buy and flip SRO buildings to mixed-use housing 21. Work with local colleges and universities to create Satellite campuses in the downtown core. 22. Require all large development projects to coordinate with SJCOG on Congestion Management Programs.				
Funding Opportunities	Funding Earmarks, Partnerships, RTD taxes and City Air Quality Fees	1. Explore options to secure a Congressional Earmark for high priority transit enhancement projects like the extension of Bus Rapid Transit service. 2. Continue to explore public-private partnerships with major employers. Meet with them to explain Rule 9410 and how they can comply with this rule and assess their interest in bus stop sponsorships. 3. The city and RTD should begin to explore the potential interest, political climate and feasibility of implementing a parcel tax increase, stand-alone Sales Tax or other form of direct tax increase. 4. The city should explore opportunities to direct a portion of the revenue from its Air Quality Mitigation Fee Program to the support of BRT operations and capital programs.	City of Stockton & RTD	FY 2012/13	Costs and Revenues to be determined	Not Applicable
Funding Opportunities	RTD Fare Study and Related Programs	1. Complete the RTD Fare Study 2. Develop formal agreements with Stockton Unified School District to sell discounted students passes at schools and explore opportunities to partner for a Safe Routes to School grant. 3. Develop formal agreements with colleges and universities to offer subsidized or free passes with students, faculty and staff in exchange for “equitable funding contributions for RTD (U-Pass Program). 4. Evaluate the potential for fare increases in the short-term including regular fare increases to keep pace with inflation and to be consistent with peer services.	RTD	FY 2011/12	Costs and revenues to be determined	Not Applicable
Transit Service	West/Airport Bus Rapid Transit	Implement a new Bus Rapid Transit that operates at 15 minute headways	RTD	FY 2013/14	4 buses - $2.0 million (total) Annual Ops - $2.3 million	FTA 5309 TIGGER RTD Taxing Authority
Transit Service	Frequency increase on several local routes	Add service to improve frequency from every 60 to every 30 minutes on Route 55	RTD	FY 2013/14	1 bus - $500,000 Annual Operations - $500,640	FTA 5309 TIGGER RTD Taxing Authority

Appendix – Mode Split Spreadsheets

Stockton Climate Change Action Plan
Transit Network Plan for 2012-2020
Ridership, Mode Split and Cost Scenarios

SCENARIO #1 - BASELINE

No change in system efficiency or cost structure and just keeping pace with growth in population and total annual trips

OUTCOME - Very little change in mode split

Stockton Population Projections

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
						GHG Reduction Years								
Actual/Projected Pop.		292,000	296,351	300,766	305,248	309,796	314,412	319,097	323,851	328,677	333,574	338,544	343,589	348,708
Growth	1.49%													

Source: SJCOG 2009 (SJCOG…http://www.sjcog.org/docs/pdf/Transportation/RTP/2011/Ch3_Assumptions.pdf)

Projected Annual Trips

Current transit trips		3,958,427												
Mode split assumption for transit	3.0%													
Projected non transit mode share	97.0%													
Project annual growth in trips	1.0%													
Projected Annual Trips		131,947,567	133,267,042	134,599,713	135,945,710	137,305,167	138,678,219	140,065,001	141,465,651	142,880,307	144,309,110	145,752,202	147,209,724	148,681,821

Source: Settlement Agreement states VMT growth to remain below projected popualtion growth

Projected Transit Ridership and Operating Costs

Ridership		3,958,427	3,998,011	4,037,991	4,078,371	4,119,155	4,160,347	4,201,950	4,243,970	4,286,409	4,329,273	4,372,566	4,416,292	4,460,455
Annual average growth	1.0%													

Source: estimate based on SJRTD performance since 2005 and NN projections

Transit projected mode split		3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Rev Hours		197,000	198,906	200,895	202,904	204,933	206,982	209,052	211,143	213,254	215,387	217,541	219,716	221,913
Pass/Hour		20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1
Cost per hour (inflation)	2.5%	$ 104	$ 107	$ 109	$ 112	$ 115	$ 118	$ 121	$ 124	$ 127	$ 130	$ 133	$ 136	$ 140
inflation														
Total Op Cost		**$ 20,488,000**	**$ 21,203,383**	**$ 21,950,802**	**$ 22,724,568**	**$ 23,525,609**	**$ 24,354,887**	**$ 25,213,397**	**$ 26,102,169**	**$ 27,022,270**	**$ 27,974,805**	**$ 28,960,917**	**$ 29,981,790**	**$ 31,038,648**

Transit ridership in 2020 if only 3% mode split =	4,460,455
Projected ridership with incremental growth =	4,460,455
Net increase and contribution to GHG reduction =	**0**

Stockton Climate Change Action Plan
Transit Network Plan for 2012-2020
Ridership, Mode Split and Cost Scenarios

SCENARIO #2 - Improve Efficiency but not Cost Effectiveness

System becomes more productive, and mode split increases but costs are very very high!
More ridership than Scenario #1 but also much more expensive to operate
OUTCOME - Mode split improves from 3.0% to 5.0%

Stockton Population Projections

		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
						GHG Reduction Years								
Actual/Projected Pop.		292,000	296,351	300,766	305,248	309,796	314,412	319,097	323,851	328,677	333,574	338,544	343,589	348,708
Growth	1.49%													

Source: SJCOG 2009 (SJCOG…http://www.sjcog.org/docs/pdf/Transportation/RTP/2011/Ch3_Assumptions.pdf)

Projected Annual Trips

Current transit trips		3,958,427												
Mode split assumption for transit	3.0%													
Projected non transit mode share	97.0%													
Project annual growth in trips	1.0%													
Projected Annual Trips		131,947,567	133,267,042	134,599,713	135,945,710	137,305,167	138,678,219	140,065,001	141,465,651	142,880,307	144,309,110	145,752,202	147,209,724	148,681,821

Source: Settlement Agreement states VMT growth to remain below projected popualtion growth

Projected Transit Ridership and Operating Costs (assume 5% mode split by 2020)

Ridership		3,958,427	4,172,182	4,397,480	4,634,944	4,885,231	5,149,033	5,427,081	5,720,143	6,029,031	6,354,599	6,697,747	7,059,426	7,440,634
Annual average growth	5.4%													

Source: estimate based on SJRTD performance since 2005 and NN projections

Transit projected mode split		3.0%	3.1%	3.3%	3.4%	3.6%	3.7%	3.9%	4.0%	4.2%	4.4%	4.6%	4.8%	5.0%
Rev Hours		197,000	207,571	218,780	230,594	243,046	256,171	270,004	284,584	299,952	316,149	333,221	351,215	370,181
Pass/Hour		20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1
Cost per hour (inflation)	2.5%	$ 104	$ 107	$ 109	$ 112	$ 115	$ 118	$ 121	$ 124	$ 127	$ 130	$ 133	$ 136	$ 140
inflation														
Total Op Cost		**$ 20,488,000**	**$ 22,127,095**	**$ 23,905,007**	**$ 25,825,774**	**$ 27,900,875**	**$ 30,142,711**	**$ 32,564,677**	**$ 35,181,249**	**$ 38,008,063**	**$ 41,062,010**	**$ 44,361,343**	**$ 47,925,777**	**$ 51,776,613**

Transit ridership in 2020 at 3% mode split =	4,460,455
Projected ridership with incremental growth =	7,440,634
Net increase and contribution to GHG reduction =	**2,980,180**
Net increase over 2020 status quo =	**2,980,180**
Net increase in 2020 Operating Budget over Status Quo =	**$ 20,737,965**

Stockton Climate Change Action Plan
Transit Network Plan for 2012-2020
Ridership, Mode Split and Cost Scenarios

SCENARIO #3 - Improve Efficiency and Cost Effectiveness

System becomes more productive and mode split increases (unit costs DO NOT change)
Same ridership as Scenario #2 but costs less to operate
OUTCOME - Mode split improves from 3.0% to 5.0%

Stockton Population Projections

						GHG Reduction Years								
		2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Actual/Projected Pop.		292,000	296,351	300,766	305,248	309,796	314,412	319,097	323,851	328,677	333,574	338,544	343,589	348,708
Growth	1.49%													

Source: SJCOG 2009 (SJCOG…http://www.sjcog.org/docs/pdf/Transportation/RTP/2011/Ch3_Assumptions.pdf)

Projected Annual Trips

Current transit trips		3,958,427												
Mode split assumption for transit	3.0%													
Projected non transit mode share	97.0%													
Project annual growth in trips	1.0%													
Projected Annual Trips		131,947,567	133,267,042	134,599,713	135,945,710	137,305,167	138,678,219	140,065,001	141,465,651	142,880,307	144,309,110	145,752,202	147,209,724	148,681,821

Source: Settlement Agreement states VMT growth to remain below projected popualtion growth

Projected Transit Ridership and Operating Costs (assume 5% mode split by 2020)

Ridership		3,958,427	4,172,182	4,397,480	4,634,944	4,885,231	5,149,033	5,427,081	5,720,143	6,029,031	6,354,599	6,697,747	7,059,426	7,440,634
Annual average growth	5.4%													

Source: estimate based on SJRTD performance since 2005 and NN projections

Transit projected mode split		3.0%	3.1%	3.3%	3.4%	3.6%	3.7%	3.9%	4.0%	4.2%	4.4%	4.6%	4.8%	5.0%
Rev Hours		197,000	207,571	218,780	230,594	231,528	232,988	234,939	237,350	240,200	243,471	247,149	251,225	255,692
Pass/Hour (assume 1 pass/hr annual improvement (start 2012)		20.1	20.1	20.1	20.1	21.1	22.1	23.1	24.1	25.1	26.1	27.1	28.1	29.1
Cost per hour (inflation)	2.5%	$ 104	$ 107	$ 109	$ 112	$ 115	$ 118	$ 121	$ 124	$ 127	$ 130	$ 133	$ 136	$ 140
inflation														
Total Op Cost		**$ 20,488,000**	**$ 22,127,095**	**$ 23,905,007**	**$ 25,825,774**	**$ 26,578,559**	**$ 27,414,863**	**$ 28,335,498**	**$ 29,342,038**	**$ 30,436,735**	**$ 31,622,468**	**$ 32,902,693**	**$ 34,281,428**	**$ 35,763,228**

Transit ridership in 2020 at 3% mode split =	4,460,455
Projected ridership with incremental growth =	7,440,634
Net ridership increase & contribution to GHG reduction =	**2,980,180**
Net ridership increase over 2020 status quo =	**2,980,180**
Net increase in 2020 Operating Budget over Status Quo =	**$ 4,724,580**

Appendix E

State Greenhouse Gas Inventory Calculations

Table E-1 Projected California Reductions Needed to Meet AB-32 Targets Based on Current Inventory Data (excluding Sinks)			
Year	**MMT CO2e**	**Reduction to 1990**	**Source and Notes**
1990	433.29	0%	CARB 2007. California Greenhouse Gas Inventory - Summary by Economic Section. Last Updated November 19, 2007. Available: http://www.arb.ca.gov/cc/inventory/archive/tables/ghg_inventory_sector_90-04_sum_2007-11-19.pdf. Last accessed May 4, 2013.
2000	462.90	6%	CARB 2013, Inventory UpdateCalifornia Air Resources Board. 2013. California Greenhouse Gas Inventory for 2000–2011-by Category as Defined in the Scoping Plan. Last Revised: August 1, 2013. Available: < http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_00-11_2013-08-01.pdf. Last accessed: September 28, 2013.
2001	478.36	9%	
2002	475.82	9%	
2003	479.08	10%	
2004	489.18	11%	
2005	482.09	10%	
2006	479.18	10%	
2007	485.54	11%	
2008	483.22	10%	
2009	454.69	5%	
2010	449.59	4%	
2011	448.11	3%	
2020	544.78	20%	CARB 2010. Greenhouse Gas Emissions Forecast for 2020: Data Sources, Methods and Assumptions. AB 32 Baseline Forecast. October 28, 2010. Available: http://www.arb.ca.gov/cc/inventory/data/tables/2020_forecast_methodology_2010-10-28.pdf. Last accessed May 4, 2013. Document identifies Pavley 1 and RPS would result in reductions in 2020 of 38 MMTCO2e.
2020 (w/ RPS/Pavley)	506.78	15%	CARB 2010. California GHG Emissions Forecast (2008 - 2020). Last Updated 10/28/2010. Available: http://www.arb.ca.gov/cc/inventory/data/tables/2020_ghg_emissions_forecast_2010-10-28.pdf. Last accessed May 4, 2013.
Projected California Reductions Needed to Meet AB-32 Targets Based on Prior Inventory Data Available at the time of the 2008 AB32 Scoping Plan (Excluding Sinks)			
Year	**MMT CO2e**	**Reduction to 1990**	**Source and Notes**
1990	433.29	0%	CARB, California Greenhouse Gas Inventory for 1990 to 2004, November 2007
2000	457.29	5%	CARB, California Greenhouse Gas Inventory for 1990 to 2004, November 2007
2001	473.49	8%	CARB 2007
2002	468.54	8%	CARB 2007
2003	467.42	7%	CARB 2007
2004	484.40	11%	CARB 2007
2002 - 2004 Average	473.45	8%	CARB 2007
2005 (forecast)	491.40	12%	Projected based on 2004 - 2020 trend
2006 (forecast)	498.40	13%	Projected based on 2004 - 2020 trend
2007 (forecast)	505.40	14%	Projected based on 2004 - 2020 trend
2008 (forecast)	512.40	15%	Projected based on 2004 - 2020 trend
2020 (BAU)	596.41	27%	AB-32 Scoping Plan

Table E-2
California 1990 and 2020 Land Use Sector Emissions

Sector	1990 Emissions (MMT CO_2e/yr)	2020 Emissions (MMT CO_2e/yr)	Included in Stockton GHG Inventory?
Onroad Transportation	138.0	168.2	Yes
Electric Power	110.6	110.8	Yes
Commercial and Residential Fuel Use	44.1	44.9	Yes
Landfills	6.3	8.5	Yes
High Global Warming Potential Gases	0.0	37.9	Yes
Total Gross Emissions	**299.0**	**370.3**	

Note:
Land Use Sector defined to include those sectors most closely related to typical City and County emissions associated with residential and commercial use that are usually included in local City and County GHG inventories. The estimate above exclude stationary source emissions from industrial sources such as refineries or concrete manufacturing plants, emissions associated with agriculture, forestry or land cover change (i.e. changes in carbon stocks and sequestration). High global warming potential gases were not a substantial part of the 1990 inventory because at the time the use of substitutes for ozone-depleting substances (ODS) had not come into widespread use yet.

Source:
1990 = CARB 2007. Staff Report. 1990 Greenhouse Gas Emissions Level and 2020 Emissions Limit. Available: http://www.arb.ca.gov/cc/inventory/pubs/reports/staff_report_1990_level.pdf. Last accessed May 4, 2013

2020 = CARB. 2012. Greenhouse Gas Inventory - 2020 Emissions Forecast. Available: http://www.arb.ca.gov/cc/inventory/data/forecast.htm. Last accesses May 4, 2013. Note that forecast takes into account the effect of the Renewable Portfolio Standard requirement for 20% RPS by 2010 and of the Pavley 1 vehicle efficiency regulation.

Table E-3
California GHG Efficiency Metric Calculations

	1990	2020 (w/AB 32)
Population	29,758,213	40,643,643
Land Use GHG Emissions (MT CO2e)	299,000,000	299,000,000
GHG Emissions (MT CO2e Per Capita)	10.0	7.4

Sources:

GHG data for 1990 from Table E-2. GHG emissions for 2020 assumed to be equivalent to 1990 emissions under AB 32 compliant scenario (presumes equivalent reductions across the board, as CARB does not have a published by sector 2020 forecast with Scoping Plan implementation..

Population data for 1990 is from the U.S. Census: 1990-2000 Population State of California, Department of Finance, E-4 Historical Population Estimates for City, County and the State, 1991-2000, with 1990 and 2000 Census Counts. Sacramento, California, August 2007.

Population for 2020 is from: State of California, Department of Finance, 2013 State and County Population Projections 2010 through 2060, Sacramento, California, January 31, 2013.

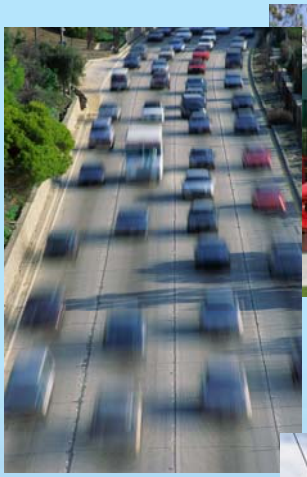
Appendix F

Climate Impact Study Process

CITY OF STOCKTON

City of Stockton

Climate Impact Study Process







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Acronyms and Abbreviations

AB	Assembly Bill
BMPs	best management practices
BPS	best performance standards
C&D	construction and demolition
CA AGO	California Attorney General
CALGreen	California Green Buildings Standards Code, Title 24, Part 11
CAP	Climate Action Plan
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CCAP	Center for Clean Air Policy
CCP	coal combustion byproducts
CEQA	California Environmental Quality Act
CF	connectivity factor
CH_4	methane
CISP	Climate Impact Study Process
City	City of Stockton
CIWMB	California Integrated Waste Management Board
CNG	compressed natural gas
CO_2	carbon dioxide
ED	environmental document
EIR	Environmental Impact Report
EPA	U.S. Environmental Protection Agency
EPEAT	Electronic Product Environmental Assessment Tool
EPP	Environmentally Preferable Purchasing
GHG	greenhouse gas
GHG guidance	Final Staff Report for Addressing Greenhouse Gas Emissions Impacts under the California Environmental Quality Act
GPS	Global positioning systems
LED	light-emitting-diode
LEED	Leadership in Energy and Environmental Design
LID	low-impact development
MDP	Master Development Permit

MND	Mitigated Negative Declaration
MPOs	metropolitan planning organizations
$MTCO^2e$	metric ton of carbon dioxide equivalent
NEV	neighborhood electric vehicles
RTPs	Regional Transportation Plans
SCS	sustainable communities strategy
SJVAPCD	San Joaquin Valley Air Pollution Control District
SP	Specific Plan
VMT	vehicle miles traveled

Introduction

The City of Stockton faces a demanding challenge to generate the infrastructure required to accommodate future growth, while simultaneously meeting greenhouse gas (GHG) targets established by the state to address global warming.[1]

In response to these challenges, the City adopted their 2035 General Plan, which outlines development goals and stipulations for the reduction of City-wide GHG emissions. As a condition for approval of the General Plan, the City entered into a Settlement Agreement with the Sierra Club and the Attorney General. This agreement was enacted to ensure the future growth outlined in the 2035 General Plan addresses GHGs in a meaningful and constructive manner. The agreement requires, among other things, preparation of a Climate Action Plan (CAP). As described in Chapter 3 of the CAP, the City proposes to approach new development through a flexible, performance-based approach call the Development Review Process or DRP. The DRP would require discretionary new development to reduce project-level emissions by 29% compared to Business-as-Usual (BAU) or unmitigated conditions. This Climate Impact Study Process (CISP) provides a methodology by which project applicants could comply with the DRP reduction requirement and document that reduction for use in CEQA project evaluations. Use of the CISP is not mandatory, as long as project proponents can clearly document and demonstrate compliance of their project with the mandated reduction requirement.

Overview of the CISP

The CISP includes a compilation of best management practices (BMPs) that can be applied by project applicants for new development to reduce GHG emissions. It is intended to support the City's commitment to address GHG emissions from new development and provide clear guidance on climate change to project applicants. The CISP will facilitate California Environmental Quality Act (CEQA) analyses for projects within the City, as well as expedite the review and permitting process.

Settlement Agreement Requirements for Interim Period Prior to CAP Adoption

The Settlement Agreement has specific requirements for the CISP for the interim period after the Agreement was signed and before a Climate Action Plan is adopted. Thus, the CISP can be used in the interim period to meet the Agreement requirements, but can also be used for implementation of the DRP if the CAP is adopted by the City Council.

Prior to adoption of a CAP, the Agreement, Section 9, requires to City to complete the following for development projects that are subject to a Specific Plan (SP) or a Master Development Plan (MDP) or projects of significance (collectively referred to below as "qualified projects"):

(1) "*Formulate proposed measures necessary for the project to meet any applicable GHG reduction targets*." The CISP presents a quantitative point-based approach to identify GHG reduction measures that collectively would be required to achieve a 29 percent reduction compared to

[1] The most influential GHG initiatives are Assembly Bill (AB) 32 and Senate Bill 375. AB 32, the Global Warming Solutions Act of 2006, established a state goal of reducing GHG emissions statewide to 1990 levels by 2020.. SB 375 requires regional transportation plans, developed by metropolitan planning organizations (MPOs) to incorporate a "sustainable communities strategy" (SCS) in their Regional Transportation Plans (RTPs) to reduce per capita vehicle emissions from passenger and light-duty vehicles.

"Business as Usual" conditions. This reduction target is functionally equivalent to the City's interim GHG reduction target and is consistent with the CEQA significance threshold recommended by the San Joaquin Valley Air Pollution Control District (SJVAPCD).

(2) "*Assess the project's VMT and formulate proposed measures that would reduce the project's VMT*." Through CEQA review and the CISP, qualified projects will quantify their VMT and identify proposed VMT reduction measures. Specific worksheets are included in the CISP to identify transportation-related VMT/GHG reduction measures.

(3) "*Assess the transit, especially BRT needs of the project and identify the project's proposed fair share of the cost of meeting such needs*." Qualified projects will be subject to any current transit fee fair- share requirements. The CISP includes identification of transportation GHG reduction measures that includes consideration of proximity to transit. The Climate Action Plan includes a proposed Transit Plan (see Appendix D) that evaluated the potential for expanded transit beyond current plans. Where new requirements for transit funding are ultimately adopted as part of the Transit Plan and the Climate Action Plan they will apply retroactively to any qualified projects approved during the interim period

(4) "*Assess whether project densities support transit and, if not, identify proposed increases in project density that would support transit service, including BRT service*." The CISP includes identification of transportation GHG reduction measures that includes consideration of densities that are supportive of transit. If densities are below that considered to support transit, the City shall consider alternatives, as part of the CEQA review, that would include potential increases in project density, where such increases are feasible and would meet the project's goals and objectives.

(5) "*Assess the project's estimated energy consumption and identify proposed measures to ensure that the project conserves energy and uses energy efficiently*." The CISP includes identification of energy efficiency and renewable energy measures that, where implemented, would reduce energy consumption. All new projects would also be subject to the City's green building ordinance, which is compliant with the state Cal-Green requirements.

(6) "*Formulate proposed measures to ensure that the project is consistent with a balance of growth between land within Greater Downtown Stockton and existing City limits and land outside the existing City limits*." All qualified projects would be first reviewed relevant to current General Plan growth policies. The City is currently evaluating potential General Plan amendments necessary to implement the Settlement Agreement requirements concerning balancing of growth. As the amendments to the General Plan won't be formally adopted until completion of the CEQA process and the Climate Action Plan in 2012, there will need to be a project by project evaluation of the impact of any qualified project considered in the interim on the balancing of growth. All qualified projects will also be subject to any subsequent requirements adopted in the Climate Action Plan, which could mean that the timing of issuance of building permits outside the Greater Downtown Stockton area may be conditioned upon ordinances or enactments adopted pursuant to the Climate Action Plan.

(7) "*Formulate proposed measures to ensure that City Services and infrastructure are in place or will be in place prior to the issuance of new entitlements for the project or will be available at the time of development* ." Current General Plan requirements for Specific Plans and Master Development Plans require infrastructure master plans that determine the requirement for infrastructure timing. Thus, current development application review and CEQA project review addresses this requirement.

(8) "*Formulate proposed measures to ensure that the project is configured to allow the entire development to be internally accessible by all modes of transportation*." The CISP includes identification of transportation GHG reduction measures that includes consideration of access by alternative modes of transportation to and within the project. In addition, CEQA review of transportation will also include a qualitative evaluation of the accessibility of the project to multiple modes of transportation.

The City is also required to complete the following review requirements as part of the interim approval process:

- review studies and recommendations pursuant to the 8 items above and conduct at least one public hearing prior to approval of the proposed project;
- consider the feasibility of imposing conditions of approval based on the studies and recommendations pursuant to the 8 items above; and
- consider include a requirement that all new development approvals and agreements be subject to ordinances and enactments adopted after the effective date of any such approvals as part of the Climate Action Plan.

The City will incorporate findings relevant to the review studies and recommendations pursuant to the 8 items above, consider conditions of approval and will require that all qualified projects are subject to subsequent ordinances and enactments adopted pursuant to the Climate Action Plan.

Applicability

The CISP is an available program in the period before a CAP is adopted for all development projects not exempt from CEQA located within the City that are (1) subject to a special plan or master development plan and (2) considered projects of significance. The CISP is intended to assist development projects to provide information about the 8 required review items noted above. If a development project chooses not to utilize the CISP to identify GHG reduction measures, VMT reduction measures, transit needs and fair-share funding, transit-supporting densities, energy consumption reduction measures, or transit access measures, then applicants will be required to provide the functional equivalent separately as part of their development applications.

After CAP adoption, the CISP is an available program for all discretionary projects.

Purpose

The CISP has two primary purposes. The first is to provide methods by which the City can qualitatively assess and benchmark GHG emissions from future development. This information will assist the City in managing reductions of GHG emissions associated with the new development. The second is to provide a list of BMPs that can be adopted by project applicants during the CEQA process. Consistent with the SJVAPCD *Final Staff Report for Addressing Greenhouse Gas Emissions Impacts under the California Environmental Quality Act* (GHG guidance), reduction scores identified for each measure can be used to qualitatively assess the significance of a project on climate change.

Organization

The CISP is organized in the following manner.

- Section 1: Project Information.
- Section 2: Construction Emissions Worksheet.
- Section 3: Construction Best Management Practices.
- Section 4: Operational Emissions Worksheet:
    - Transportation.
    - Energy Consumption.
    - Water.
    - Waste.
    - Land Cover.
- Section 5: Operational Best Management Practices.
- Section 6: Best Management Practices Scorecard.

Each section includes instructions for completing the questionnaires and using the BMPs.

CISP Consistency with CEQA and SJVAPCD Guidance

The CISP functions to facilitate the CEQA process for projects located within the City. Pursuant to the 2011 CEQA Guidelines, all projects subject to CEQA must evaluate project-level GHG emissions and identify feasible mitigation to reduce significant impacts associated with climate change. Specifically, the guidelines require lead agencies to describe, calculate, or estimate the amount of GHG emissions resulting from a project. They also emphasize the necessity to determine potential climate change effects, and confirm the discretion of lead agencies to determine appropriate significance thresholds. (CEQA Guidelines Section 15064.4). SJVAPCD has adopted guidance for determining significant climate change impacts in the SJVAB.

SJVAPCD GHG Guidance

SVJAPCD's GHG guidance is intended to streamline CEQA review by pre-quantifying emissions reductions that would be achieved through the implementation of best performance standards (BPS).[2] Projects are considered to have a less-than-significant cumulative impact on climate change if any of the following conditions are met:

1. Comply with an approved GHG reduction plan.[3]
2. Achieve a score of at least 29[4] using any combination of approved operational BPS.
3. Reduce operational GHG emissions by at least 29% (demonstrated quantitatively).

Pursuant to the Settlement Agreement, the City is currently in the process of developing a CAP (a GHG reduction plan). Since the proposed DRP utilizes the same GHG reduction target as the interim practice, before and after a CAP is adopted[5], discretionary projects will be able to achieve a less-than-significant finding by through either scoring operational BPS or quantifying GHG emissions reductions.

Using the CISP

The CISP incorporates SJVAPCD's BPS, but also builds on SJVAPCD's guidance by providing additional, pre-quantified mitigation strategies. In addition, it includes information on co-benefits that might help project applicants assess the implementation feasibility of individual measures. Project applicants can therefore use the CISP to identify and score feasible mitigation. Significance can then be determined and reported in the project's environmental document. The CISP thus functions to facilitate the CEQA process for projects located within the City.

The CISP should be completed according to the following steps: Figures F-1 and F-2 graphically illustrate how these steps are integrated with the CEQA process for both a Mitigated Negative Declaration (MND)and Environmental Impact Report (EIR). These figures demonstrate that the CISP should be viewed as a tool to help inform and complete the project-level climate change analysis required by CEQA. The CEQA process, as it relates to the air quality and climate change analysis, is highlighted with blue boxes, while the CISP steps discussed below are highlighted with green boxes.

[2] BPS and BMPs both refer to strategy to reduce GHG emissions. They are functionally equivalent and can be used interchangeably.

[3] A GHG Reduction Plan and a CAP both refer to a document that quantifies and reduces GHG emissions within a particular jurisdiction. They are functionally equivalent and can be used interchangeably.

[4] A score of 29 represents a 29% reduction in GHG emissions relative to unmitigated conditions (1 point = 1%). This goal is consistent with the reduction targets established by AB 32.

[5] The CAP is expected to be considered in 2012. If adopted, the City may provide additional guidance for evaluating new projects' consistency with the CAP as the means to demonstrate whether a project is or is not significant under CEQA.

Step 1. Complete project questionnaires in the CISP (Sections 2 and 4).

The majority of information requested in Sections 2 and 4 of the CISP will have likely been developed as part of air quality analysis completed for the project's environmental document (ED). For example, an analysis of the construction schedule and equipment will be required to quantify criteria pollutants. Completion of Sections 2 and 4 therefore directly overlaps with the project's air quality assessment. The project applicant should therefore refer to the ED when completing these sections.

Step 2. Identify feasible BMPs (Sections 3 and 5).

Sections 3 and 5 describe BMPs to reduce GHG emissions. Consistent with CEQA, all projects must mitigate GHG emissions (when significant) through the implementation of feasible mitigation. Information presented in Sections 3 and 5 is intended to assist project applicants with the selection of mitigation that will be incorporated into the climate change section of the ED.

Step 3. Score mitigation (Section 6).

BMPs identified in Sections 3 and 5 are given a score in Section 6 based on their GHG reduction potential. Score values were determined using SJVAPCD GHG guidance. Where BMPs are identified in Sections 3 and 5 and not in SJVAPCD GHG guidance, scores were calculated based on an analysis of typical land use development projects, where a score of 1 corresponds to a 1% reduction in emissions. Project applicants should use the scorecards presented in Section 6 to score selected measures. If the total operational emissions score is 29 or greater, the project is considered less than significant per SJVAPCD GHG guidance. If the total operational score is less than 29, the project is considered potentially significant. [6]

Step 4. (Optional) Quantify BMP reductions using project-specific inputs.

SJVAPCD guidance recommends quantification of GHG emissions for all projects in which an EIR is required, regardless of whether BPS achieve a score of 29. Some of the projects subject to the CISP will require an EIR. Project applicants are therefore encouraged to utilize the GHG inventory developed for the EIR to quantify reductions associated with the BMPs selected in Section 6 using project specific inputs (e.g., project generated vehicle miles traveled). Although not required by SJVAPCD, calculating project-specific reductions provides the following benefits:

- GHG analysis is clearer and more transparent to the general public.
- Significance conclusion is more defensible because the analysis is based on project-specific inputs, rather than a "typical land use development project."
- Utilizing project-specific inputs might yield higher reduction values than those identified in Section 6 (see "Limitations of the CISP" for additional information). Thus, projects that do not achieve a mitigation score of 29 might still be able to demonstrate a less-than-significant finding if the project-specific analysis achieves a 29% reduction in GHG emissions relative to unmitigated emissions.

[6] Note that the SJVAPCD currently does not have guidance on how to evaluate significance of construction GHG emissions, but guidance might be provided in future years. At present, no air district has identified a specific significance threshold for construction emissions and thus CEQA evaluations are often qualitative in nature and done on a case-by-case approach. An analysis of whether the project has adopted reasonable and feasible BMPs to reduce construction-related greenhouse gas emissions should be documented in the ED.

Step 5. Submit to the City for review: The completed project CISP should be submitted to the City's Community Development Department for review.

Figure F-1. CISP and CEQA Integration Flow Diagram for an MND.

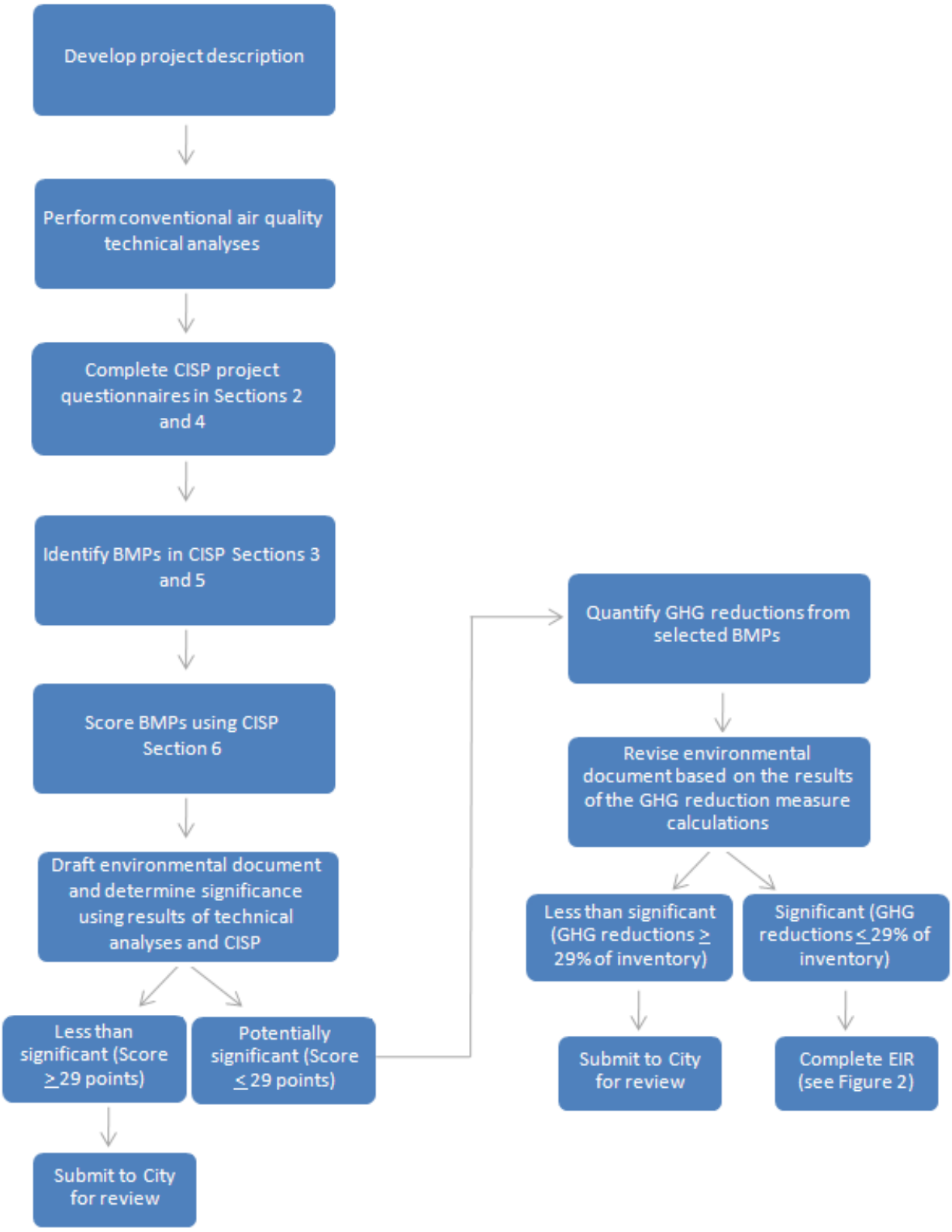
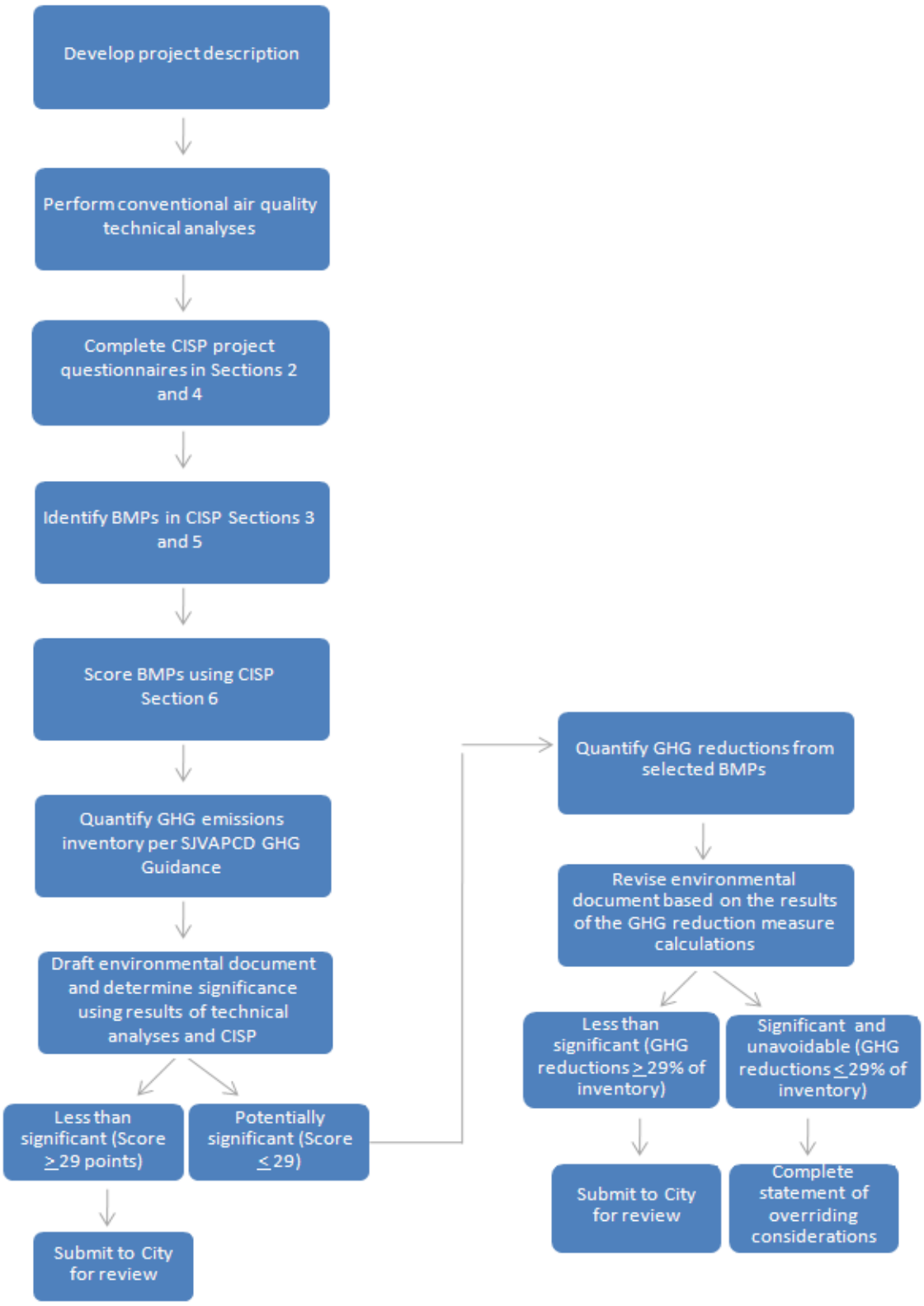


Figure F-2. CISP and CEQA Integration Flow Diagram for an EIR.



Limitations of the CISP

This section briefly outlines the underlying limitations associated with the CISP.

Qualitative Assessment of GHG Emissions

The CISP is not intended to provide a robust emissions inventory and reduction measure analysis for individual projects. Rather, it is designed to provide a qualitative appraisal of likely GHG emissions due to new land use development. The assessment of emissions is based on a series of questions that have been drafted to characterize construction and operational activities. The efficacy of the emissions assessment is based on the specificity and accuracy of responses provided by the project applicant. To avoid error in appraising project emissions, it is therefore important for project applicants to answer the questions with the most precise information available. Given the qualitative nature of the CISP, it is important to note that it does not obviate the need for project applicants to report and analyze effects on climate change in the project's environmental document. Rather, the CISP is intended to promote BMP awareness and facilitate the selection of mitigation, which can be incorporated into a project's environmental document and help determine the significance finding.

Combination of Data Sources for the BMP Scorecard

Development of the BMP scorecard required the use of multiple sources of data and literature. When different data sources are combined, there might be slight discrepancies in underlying assumptions and methodologies, which might affect the final GHG reduction potential quantified for each BMP. For example, the majority of transportation BMPs and their associated GHG reduction potential were drawn from the SJVAPCD Interim GHG Emissions Reduction Calculator, while many of the building energy, water, and waste BMPs were derived from information presented in California Air Pollution Control Officers Association (CAPCOA) (2010). For measures not included in SJVAPCD or CAPCOA documents, reductions were calculated based on professional experience. It is not possible to determine the precise magnitude of error that was introduced by combining differing sources. However, the potential for error was reduced through careful review of the data sources and exclusion of incompatible information.

Lack of Project-Specific Information for the BMP Scorecard

The CISP is intended to streamline the CEQA and permitting processes by providing clear guidance for the evaluation of GHG emissions, and feasible mitigation options. Project-specific characteristics are not considered in the quantification of emissions benefits achieved by BMPs. Rather, the GHG reductions are based on published literature and a range of effectiveness that has been demonstrated in past projects. Developing a generalized point system assigns identical reductions benefits to every project implementing a specific BMP, regardless of project characteristics.

This approach might slightly overestimate or underestimate actual GHG benefits achieved by an individual project. Consider the following example:

- Project A: 100-unit single-family housing development where building energy emissions comprise 50% of the project's total operational emissions.
- Project B: 100-unit multifamily housing development where building energy emissions comprise 25% of the project's total operational emissions.

If Project A and B implement BMP-40 (Exceed Title 24 Standards), they will both receive 1 point (refer to Section 6.2.2). In reality, Project A would likely receive a higher GHG benefit than Project B, due to the fact that building energy emissions represent a greater percentage of Project A's total emissions profile.

The example demonstrates that all projects are unique, and that projects analyzed with the CISP might be different from the idealized project used to formulate the GHG reductions summarized in Section 6. As such, the GHG reductions provided in the CISP should be viewed in relative terms, where a BMP with a score of 1 will likely have fewer GHG reductions than a BMP with a score of 10. Completion of Step 4 (above), which involves quantifying GHG reductions based on project-specific inputs, will help reduce this limitation and generate a database of reduction efficacies unique to the City that can be used to improve the CISP scorecards over time.

Section 1
Project Information

1.1 Instructions to the Project Applicant

This section asks you to complete some basic information about your project. You must answer each question. Failure to complete all questions might cause in delays in project approval. If a question does not apply to your project, please enter "N/A" in the response box. City staff can assist you if you have difficulty responding to the questions.

1.2 Project Background

1. What is your project's name?

2. Where is your project located?

3. Check the type of project that best describes your project.

   ☐ Residential development.

   ☐ Commercial development.

   ☐ Industrial development.

   ☐ Mixed use.

   ☐ Transportation development.

   ☐ Other. Please describe:

4. What is the size of your project?

   acres.

5. Briefly describe your project (2–5 sentences).

6. Specify any environmental documentation (e.g., CEQA document) that has been prepared, or will be prepared, for your project.

7. List any permits that will be needed for your proposed project.

8. What is the name and title of the project contact person?

9. What is the address and phone number of the project contact person?

Section 2

Construction Questionnaire and Worksheet

2.1 Instructions to the Project Applicant

The purpose of this questionnaire is to characterize activities associated with project construction. Applicants are asked to describe basic information about the construction period. Please answer the questions briefly with the most precise information available. You must answer each question. Failure to complete all questions might cause delays in project approval. If a question does not apply to your project, please enter "N/A" in the response box. City staff can assist you if you have difficulty responding to the questions.

2.2 Construction Questionnaire

2.2.1 Scheduling and Personnel

1. When will construction begin (month, year) and how long will it last?

2. Check the applicable construction phases and indicate the total number of months for each phase.

   ☐ Demolition: months.

   ☐ Site preparation: months.

   ☐ Trenching: months.

   ☐ Building construction or facility erection: months.

   ☐ Exterior coatings: months.

   ☐ Paving: months.

   ☐ Other: ; months.

3. How many construction workers will be required for each phase identified in question #2?
   Workers.

4. What is the anticipated maximum number of miles an employee will commute to the construction site?

   Miles.

2.2.2 Earth Work

5. Will the construction include site preparation and grading activities?

☐ Yes ☐ No If yes:

a. How many acres will be graded during construction?

acres.

6. Will the construction include paving activities?

☐ Yes ☐ No If yes:

a. How many acres will be paved during construction?

acres.

7. Please check the type of vegatation currently found on the construction site. If any vegetation is to be removed during construciton, provide the total acres and/or number of trees expected to be removed.

☐ Deciduous trees (e.g., Cottonwood): acres removed or trees removed.

☐ Evergreen trees (e.g., Oak, Pine): acres removed or trees removed.

☐ Shrubs: acres removed.

☐ Grass: acres removed.

☐ Pasture: acres removed.

☐ Crop: acres removed.

☐ Wet soil plants (e.g., cattail): acres removed.

☐ Water plants: acres removed.

☐ Other: acres removed of species.

2.2.3 Raw Materials

8. Will any fill material be imported or exported during construction?

☐ Yes ☐ No If yes:

a. What is the total amount to be imported during construction?

Cubic yards.

b. What is the total amount to be exported during construction?

Cubic yards.

9. Will any fill water be used during construction for dust suppression or other activities?

☐ Yes ☐ No If yes:

a. How many gallons are anticipated to be used during construction?

Gallons.

10. Will the construction require any concrete?

☐ Yes ☐ No If yes:

a. What is the anticipated volume of material to be used during construction?

Cubic feet.

11. Will the construction require any pavement?

☐ Yes ☐ No If yes:

b. What is the anticipated volume of material to be used during construction?

Cubic feet.

12. What is the anticipated volume of waste to be generated during construction?

Cubic feet.

13. Will the project consume any electricity during construction?

☐ Yes ☐ No If yes:

a. What is the anticipated usage (kilowatt-hours)?

Kilowatt-hours.

2.2.4 Equipment and Hauling

14. Will construction require the use of heavy-duty equipment?

☐ Yes ☐ No If yes:

a. What is the type and number of equipment pieces to be used during construction activities (e.g., 2 graders, 3 cranes, 1 bulldozer)?

b. What is the anticipated horsepower of each of the construction equipment pieces?

c. How many hours per day will each of the construction equipment pieces operate?

15. How many truck haul trips will be required to transport materials and supplies (including soil, water, waste, equipment, etc.) during construction?

Trips.

16. What are the anticipated truck haul trip lengths in miles?

Miles.

2.2.5 Total Emissions

17. Will an EIR be completed for your project?

☐ Yes ☐ No If yes:

a. What are the annual (if construction is greater than one year) and total construction-related GHG emissions quantified by the project's environmental document?

Annual metric tons carbon dioxide equivalent.

Total metric tons carbon dioxide equivalent.

Section 3
Construction Best Management Practices

3.1 Instructions to the Project Applicant

The purpose of this section is to introduce the construction BMPs and describe their potential application. Each BMP is given a score based on its GHG reduction potential (refer to Section 6). Scores values were originally determined based on an analysis of typical land use development projects, where a score of 1 corresponds to a 1% reduction in total construction emissions. To the extent that an actual project is similar to the typical project used to develop the scoring system, there will be a correlation between points and percent GHG reduction. Given that all projects are unique, and the project analyzed with the CISP might differ from the idealized project used to formulate the scoring system, points might not precisely equate with percent reductions for any given project. As such, the scores should be viewed in relative terms, where a BMP with a score of 1 will likely have fewer GHG reductions than a BMP with a score of 10. This type of comparative analysis should help guide the applicant when considering implementation of BMPs. It is also important to note that construction points cannot be added to the operational BMP points. The percent reduction from total construction emissions is independent from operational emissions.

It is not intended, and likely not possible, for all projects to adhere to all of the BMPs listed below. Rather, these BMPs provide a portfolio of options from which a project applicant could choose the most appropriate GHG reduction measure while taking into consideration cost, environmental or economic co-benefits, schedule, and other project requirements.

In developing these BMPs, the City relied on current guidance from the U.S. Environmental Protection Agency (EPA) (2008), the California Attorney General (CA AGO) (2010), CAPCOA (2010), and prior project experience gained by ICF. The five BMP categories are as follows:

- **Fuel consumption and vehicle miles traveled (VMT).** These measures reduce GHG emissions by lowering fuel consumed by heavy-duty equipment and limiting the number of vehicle trips during the construction period.
- **Structure design and materials options.** These measures reduce GHG emissions associated with energy consumption by buildings or structures erected within the City, and with the energy used to manufacture and transport materials.
- **Waste.** These measures reduce GHGs by managing the amount of project-related waste that is ultimately deposited in landfills.[7]
- **Miscellaneous BMPs.** These measures contribute to GHG reductions by promoting behaviors that reduce GHG emissions and by contributing to carbon sequestration.

The BMPs are organized into two categories: *Quantifiable* and *Supporting*. Quantifiable measures are those BMPs that were quantified in terms of percent reduction in total construction GHG emissions, and were assigned a point value based on the magnitude of those reductions (refer to Section 6).

[7] Solid waste, when it decomposes in the anaerobic conditions of a landfill, releases methane (CH_4), a GHG 21 times more powerful than carbon dioxide (CO_2). The GHG benefits of diverting materials from landfills are significant because waste from new construction, demolition, and renovation currently comprises nearly 25% of total U.S. waste.

Supporting measures were not quantified in terms of percent reduction in total construction GHG emissions, due to insufficient information regarding the GHG benefits of these measures. These measures were evaluated qualitatively and identified as "low," "moderate," or "high" in terms of GHG reduction potential (refer to Section 6). Although the GHG reduction benefits of supporting measures cannot be explicitly quantified, they should not considered inferior strategies. Rather, the potential for GHG reductions and co-benefits of many supporting measures might exceed that of quantifiable measures. Supporting measures should therefore always be considered for mitigation even though there is no reduction quantified.

3.2 Format of the BMPs

Each BMP is presented as follows:

BMP-NUMBER: BMP Title.

Description

Each BMP, including the implementation requirements, is described in this section. The mechanisms for reducing GHG emissions are also discussed. The source (e.g., CAPCOA, ICF, etc.) of the BMP is presented in parentheses.

Co-Benefits

Co-benefits for each BMP are described in this section. Co-benefits include benefits other than a reduction in GHG emissions, such as cost savings over conventional activities, reductions in criteria pollutants, and public health benefits.

GHG Reduction Score

The score for each measure is presented in this section. Some measures have multiple scores depending on the level of implementation chosen by the applicant. For example, converting 25% of the construction fleet from diesel fuel to compressed natural gas (CNG) yields a reduction score of 5.5, while converting 50% of the fleet yields a score of 11.0 (see BMP-1). Additional details of the scoring system are presented in Section 6.

3.3 Fuel Consumption and Vehicle Miles Traveled

3.3.1 Quantifiable BMPs

Fuel Consumption

BMP-1: Alternative Fuels

Description

Power at least 25% of gasoline-powered construction vehicles (e.g., off-road equipment) by alternative fuels such as CNG rather than conventional petroleum or diesel products (CAPCOA 2010). More stringent goals include converting 50%, 75%, or 100% of the construction fleet from diesel to CNG, but these goals might not be feasible for many projects.

The magnitude of GHG reductions achieved through implementation of this measure varies depending on the analysis year, equipment, and type of fuel originally utilized by the fleet (i.e. gasoline or diesel). CAPCOA estimates a maximum GHG reduction of 22% if all construction vehicles utilize CNG.

Co-Benefits

Co-benefits include significant reductions in sulfur dioxide and carbon monoxide, which might result in health benefits to nearby sensitive receptors.

GHG Reduction Score[8]

- 25% Fleet Conversion: 0.00.
- 50% Fleet Conversion: 0.1.
- 75% Fleet Conversion: 0.1.
- 100% Fleet Conversion: 0.2.

BMP-2: Engine Electrification

Description

Utilize engine electrification (or a form of hybrid-electrification) for at least 25% of off-road vehicles (e.g., ships, construction equipment) (CAPCOA 2010). More stringent goals include electrifying 50%, 75%, or 100% of the construction fleet, but these goals might not be feasible for many projects.

Utilizing electric power eliminates 100% of GHG direct emissions from fuel combustion[9], while hybrid electric power reduces GHG emissions from fuel combustion. Indirect emissions from electricity are significantly lower than direct emissions from fuel combustion.

[8] Note that points are awarded for fleet conversions of less than 75%. If points are claimed for fleet conversions of less than 50%, the project applicant should clearly describe why the recommended goal is not feasible.

Co-Benefits

Implementation of this measure will achieve substantial health-related co-benefits because toxic air contaminates, including diesel particulate matter, will be eliminated or reduced.

GHG Reduction Score[10]

- 25% Fleet Conversion: 15.2.
- 50% Fleet Conversion: 30.4.
- 75% Fleet Conversion: 45.6.
- 100% Fleet Conversion: 60.8.

BMP-3: Equipment and Vehicle Idling

Description

Reduce unnecessary idling through the use of auxiliary power units, electric equipment, and strict enforcement of idling limits. Include language in plans and specifications for construction contracts. The maximum recommended idling time is 3 minutes (CAPCOA 2010).

Restricting idling time to 3 minutes reduces fuel consumption and direct GHG emissions. The magnitude of reductions depends on idling time under baseline conditions (i.e. pre-implementation of the BMP).

Co-Benefits

Co-benefits of this measure include compliance with California Air Resources Board (CARB) heavy-duty vehicle idling limits and reduced health risks associated with exposure to toxic air contaminants.

GHG Reduction Score

- 1.0.

Vehicle Miles Traveled

BMP-4: Heavy-Duty VMT Reduction Plan

Description

Include a VMT reduction plan for the project and demonstrate that the plan can minimize overall VMT to the project site, including minimizing the distance for truck haul trips. The plan should require that construction vehicle VMTs be reduced by 15% (ICF professional experience).

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[9] GHG emissions will occur at the electricity generation sources unless all electricity comes from renewable sources. Although indirect emissions will occur, use of electricity instead of fossil-fuel equipment produces substantial net GHG reductions.

[10] Note that points are awarded for fleet conversions of less than 75%. If points are claimed for fleet conversions of less than 50%, the project applicant should clearly describe why the recommended goal is not feasible.

VMT reduction goals might be accomplished by incentive programs for contractors or by placing staging areas for materials in close proximity to the construction site and choosing materials (e.g., sediment for grading projects) from quarries or vendors that are as close to a project site as is practicable. While potential sites for materials staging areas might be limited at a project location, equal consideration should be given to the resulting VMT as to other selection criteria. This could also be accomplished through careful planning of truck trips such that VMTs are maximized for project utility. These measures can be considered as part of a project's overall VMT reduction strategy.

Co-Benefits

Co-benefits of this measure include reduction in fuel usage, criteria pollutant emissions, and vehicle maintenance.

GHG Reduction Score

- 1.5.

BMP-5: Employee Commutes

Description

Reduce worker-related VMT to restoration or construction site by 50% through use of carpool, vanpool, or shuttle service from a single central location to the work-site (ICF professional experience).

Utilizing alternative modes of transportation, including public transit, reduced single-occupancy VMT.

Co-Benefits

Co-benefits of this measure include reduction in fuel usage, criteria pollutant emissions, and vehicle maintenance.

GHG Reduction Score

- 2.5.

3.3.2 Supporting BMPs

Fuel Consumption

BMP-6: Equipment Fuel Efficiency through Engine Age Requirements

Description

To the extent possible, maximize fuel efficiency by using engines on off-road construction equipment that are no more than 10 years old or have equivalent carbon dioxide emissions of an engine 10 years old or newer (ICF professional experience).

Newer engines are subject to more stringent state and federal requirements for criteria pollutant and toxic pollutant emissions, and are generally more clean burning and fuel efficient than older

engines. These characteristics typically reduce the amount of GHG emissions emitted from equipment.

Co-Benefits

Co-benefits include cost savings through reduced fuel purchases. In addition, this measure will reduce most criteria pollutants and toxic emissions, and result in lower health-related impacts on nearby communities.

GHG Reduction Score

- Low.

BMP-7: Construction Equipment

Description

Require the following technical specifications during all grading and construction activities (ICF professional experience):

- Tier 2 or Tier 3 engines[11] shall be used on all equipment.
- Global positioning systems (GPS) shall be used to guide grading equipment.
- All diesel-fueled engines used in construction and grading shall have clearly visible tags issued by the onsite designee of the applicant showing that the engine meets these conditions.

These requirements have the potential to reduce GHG emissions because newer equipment is generally more fuel efficient than older equipment, and GPS systems will increase the efficiency of grading equipment.

Co-Benefits

This measure will reduce most criteria pollutants and toxic emissions, and result in lower health-related impacts on nearby communities. It might also reduce costs associated with fuel use.

GHG Reduction Score

- Low.

BMP-8: Engine Maintenance

Description

Through contract language or other means, encourage fleet managers to employ good engine maintenance to meet manufacturer standards, and properly train operators to run equipment efficiently (Bay Area Air Quality Management District 2010).

[11] The U.S. EPA has developed a series of national regulations to address emissions from non-road diesel engines. The rulemaking was originally devised as a three-tiered-progression to emission standards. Tiers 2 and 3 represent the final phase of the original rule. Tier 2 standards set emissions limits for all engines manufactured between 2001 and 2006. Tier 3 standards set even more stringent emissions limits for engine rated more than 50 horsepower manufactured between 2006 and 2008.

Well-maintained engines run more efficiently and emit lower levels of pollution than poorly-maintained engines. Good engine maintenance can result in reduced fuel consumption and associated GHG emissions.

Co-Benefits

Co-benefits include cost savings through reduced fuel purchases and a reduced requirement for major servicing of equipment. In addition, well-maintained engines can reduce most criteria pollutants and toxic emissions, and might result in lower health-related impacts on nearby communities.

GHG Reduction Score

- Low.

BMP-9: Heavy-Duty Vehicle Plan

Description

Prepare and implement a heavy-duty vehicle plan to support other construction mitigation measures (CAPCOA 2010). The plan could include requirements for any of the following:

- Engine run time meters on construction equipment.
- Documentation of equipment serial number, age, horsepower, etc.
- Logging of daily equipment use.

Planning and documenting construction equipment operation can help contractors improve efficiency and eliminate unneeded activity. This can result in reduced fuel consumption and associated GHG emissions.

Co-Benefits

This measure has the potential to increase vehicle efficiency and therefore reduce the amount of fuel needed for equipment, possibly resulting in cost savings for the applicant as well as reduced criteria and toxic pollutant emissions.

GHG Reduction Score

- Low.

3.4 Structure Design and Materials Option

3.4.1 Quantifiable BMPs

Structure Design

BMP-10: Construction-Site Renewable Energy

Description

Utilize on-site renewable energy (solar or wind) to power at least 25% of electric construction equipment and trailers (CAPCOA 2010).

Utilizing electricity generated by alternative sources displaces energy that ordinarily would be supplied by Pacific Gas & Electric or other applicable utilities. Although production of wind and solar equipment (e.g., turbines and photovoltaic panels) generates embodied emissions, utilization of these sources produces zero emissions from electricity generation.

Co-Benefits

Co-benefits of this measure include criteria pollutant emissions reductions.

GHG Reduction Score[12]

- 0.3.

Materials Options

BMP-11: Paving Material Manufacturing

Description

Require at least 25% of paving materials to be low energy intensive, such as recycled crushed concrete and asphalt, permeable concrete block pavers, high coal combustion byproducts (CCP) content concrete, or warm mix asphalt (U.S. Environmental Protection Agency 2008). More stringent goals include requiring 50%, 75%, or 100% of paving materials to be low energy intensive.

Concrete production requires large amounts of energy and generates significant waste. The incorporation of recycled industrial by-products such as fly ash, bottom ash, boiler slag, and desulfurization gypsum can greatly reduce the energy intensity of the raw material (Green Highway Partnership 2010, Concrete Network 2010). The production and application of asphalt also require large amounts of energy, however the use of *warm mix asphalt*, a generic term for asphalt processing at 50–100º F lower temperature, can greatly reduce the energy requirements (Warm Mix Asphalt Group 2010)[13]. For areas that do not require hard paved surfaces such as parking lots, opt for native plant ground cover.

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[12] Note that points are awarded for fleet conversions of less than 50%. If points are claimed for fleet conversions of less than 50%, the project applicant should clearly describe why the recommended goal in not feasible.

[13] The University of California, Berkeley Consortium on Green Building and Design has developed a Microsoft Excel-based tool for estimating the environmental and economic effect of pavements and roads called the PaLATE model. The model and supporting information can be found at http://www.ce.berkeley.edu/~horvath/palate.html.

Co-Benefits

Co-benefits of this measure include reduced lifecycle fuel consumption and associated criteria and toxic emissions reductions.

GHG Reduction Score[14]

- 25% of Paving Materials: 1.3.
- 50% of Paving Materials: 2.5.
- 75% of Paving Materials: 3.8.
- 100% of Paving Materials: 5.0.

BMP-12: Concrete Manufacturing

Description

Require at least 25% of concrete for nonsupporting structures (e.g., curbs, sidewalks, ramps, drainage ditches, pylons, and benches) to be low energy intensive concrete (U.S. Environmental Protection Agency 2008). More stringent goals include requiring 50%, 75%, or 100% of concrete to be low energy intensive.

Concrete production requires large amounts of energy and generates significant waste. The incorporation of recycled industrial by-products such as fly ash, bottom ash, boiler slag, and desulfurization gypsum can greatly reduce the energy intensity of the raw material.[15]

Co-Benefits

Co-benefits of this measure include reduced lifecycle fuel consumption and associated criteria and toxic emissions reductions.

GHG Reduction Score

- 25% of Concrete: 1.3.
- 50% of Concrete: 2.5.
- 75% of Concrete: 3.8.
- 100% of Concrete: 5.0.

[14] Note that points are awarded for use of less than 100% of low energy intensive materials. If points are claimed for use of less than 100%, the project applicant should clearly describe why the recommended goal in not feasible.

[15] Resources and information available through the Green Highway Partnership http://www.greenhighwayspartnership.org/index.php?option=com_content&view=article&id=23&Itemid=22 and Concrete Network http://www.concretenetwork.com/.

3.4.2 Supporting BMPs

Materials Options

BMP-13: Local Building Materials

Description

Give preference to building materials (i.e. lumber, cement, carpet) that are locally or regionally extracted and manufactured (ICF professional experience).

By selecting local suppliers, contractors can minimize VMT required for hauling. However, the GHG benefit of a local supplier could be negated by a production process that is relatively more GHG intensive. To the extent possible, project proponents should weigh the entire life cycle of a material when assessing GHG benefits. If embodied emissions from production are similar, a local supplied material is preferred.

Co-Benefits

Co-benefits include reduced fuel consumption and criteria pollutant emissions from hauling of materials to the construction site.

GHG Reduction Score

- Low.

3.5 Waste

3.5.1 Quantifiable BMPs

None identified.

3.5.2 Supporting BMPs

Waste Reduction

BMP-14: Construction and Demolition Plan

Description

Implement a construction and demolition (C&D) plan that will result in at least 50% diversion of C&D waste[16] through reuse or recycling of non-hazardous construction waste from disposal (including, but not limited to, concrete, lumber, metal, and cardboard) (CAPCOA 2010).

Waste due to new construction, renovation and demolition currently accounts for about 12% of California's land-filled waste, compared to 25 % nationwide (California Integrated Waste Management Board 2009). The California Integrated Waste Management Board (CIWMB) estimates that California landfills receive more than 4 million tons of C&D waste each year. In general, waste

[16] U.S. Green Building Council LEED credits require a minimum C&D diversion of 50%.

diversion rates have risen dramatically since the early 1980s—the U.S. achieved 46% diversion in 2008 (U.S. Environmental Protection Agency 2009) and California achieved 58% diversion in 2007—however, the bulk of this diverted material is residential and commercial waste. On average, between only 20% and 30% of construction waste is diverted. The CIWMB maintains a list of resources for C&D waste that includes videos, fact sheets and toolkits for architects, builders, local governments, and C&D processors.[17]

Co-Benefits

This measure might reduce waste hauling, which will reduce fuel consumption, criteria pollutant emissions, and vehicle strain. In addition, because the number of waste-hauling trips might be reduced, this measure might result in fewer tipping fees.

GHG Reduction Score

- Low.

BMP-15: Composting

Description

In lieu of burning or landfill disposal, require at least 75% of compostable waste resulting from construction activities to be composted onsite or at the nearest facility (CAPCOA 2010).

Composting organic waste material can reduce GHG emissions by decreased landfill methane emissions or decreased combustion emissions. According to CARB, composting can result in a GHG reduction of 0.42 metric ton of carbon dioxide equivalent ($MTCO_2e$) per ton of feedstock (CARB 2010). Composting can also help offset synthetic fertilizers, which can be more energy intensive than organic fertilizers and compost.

Co-Benefits

This measure might reduce waste-hauling and tipping fees, as well as fuel combustion emissions for transporting waste if the material is composted on the site.

GHG Reduction Score

- Low.

BMP-16: Waste Hauling

Description

Require at least 50% of building or construction materials that are not recyclable or re-usable for another project to be hauled to the nearest waste disposal facility or C&D recycling facility rather than transporting such materials farther from the project site, thereby generating increased emissions from waste transportation (CAPCOA 2010).[18]

[17] Available at http://www.calrecycle.ca.gov/ConDemo/

[18] While this may not always be possible due to factors such as cost, efforts to reduce waste-hauling VMT should be incorporated into project plans.

Transporting construction waste to the nearest disposal or recycling facility can reduce emissions associated with waste hauling.

Co-Benefits

This measure might reduce waste-hauling and tipping fees, as well as fuel combustion emissions for transporting waste.

GHG Reduction Score

- Low.

3.6 Miscellaneous

3.6.1 Quantifiable BMPs

None identified.

3.6.2 Supporting BMPs

Miscellaneous

BMP-17: Construction-Area Signage

Description

Post signs within the construction area that includes a description of the BMPs in place for GHG reduction during the construction phase (ICF professional experience).

Posting signs helps market the project's actions to reduce GHG emissions to the public and the construction workforce.

Co-Benefits

No co-benefits are expected to occur.

GHG Reduction Score

No GHG reductions are expected to occur.

BMP-18: Construction Personnel Training

Description

Train construction personnel on techniques to properly maintain engines and reduce unnecessary or wasteful energy use (ICF professional experience).

Employee training can be an effective way to maximize equipment efficiency and reduce fuel use.

Co-Benefits

Co-benefits might include cost savings through reduced fuel purchases and a reduced requirement for major servicing of equipment. In addition, well-maintained engines can reduce most criteria pollutants and toxic emissions, and might result in lower health-related impacts on nearby communities.

GHG Reduction Score

- Low.

Section 4
Operational Emissions Worksheet

4.1 Instructions to the Project Applicant

This section includes five questionnaires to characterize operations of your proposed project:

- **Transportation**. This worksheet targets development density; proximity to public transit and alternative modes of transportation; and VMT generation potential.
- **Energy.** This worksheet assesses your project's energy consumption at project building-out, specifically targeting electricity usage, gas usage, renewable power options, energy efficiency options, and green building options.
- **Water.** This worksheet assesses your project's water demand at project building-out.
- **Waste.** This worksheet assesses your project's potential to generate solid waste and solicits information on waste goals and source reduction features.
- **Land Cover.** This worksheet assesses your project's potential to induce land cover change.

As requested in Section 2, please answer the questions briefly with the most precise information known, or give the best description possible. You must answer each question. Failure to complete all questions might cause delays in project approval. If a question does not apply to your project, please type "N/A" in the response box. City staff can assist you if you have difficulty responding to the questions.

4.2 Transportation

4.2.1 Development Density

4.2.1.1 Project

1. For commercial, industrial, and mixed-use projects, how many jobs per 1,000 square feet of development floor space will your project create?

   jobs per 1,000 square feet

2. For commercial, industrial, and mixed-use projects, what is the average floor-to-area ratio of your project?

   floor-to-area ratio

3. What is the approximate sidewalk coverage of your project (e.g., 50% of roadways covered with sidewalks)

   % of roadways with sidewalks

4. What is the anticipated average household size?

   persons per home

5. What is the anticipated average auto ownership?

   vehicles per home

4.2.1.2 Study Area (optional, provide only if available)

6. What is the employment rate within one mile of your project?

   % employed

7. What is the anticipated average household size within one mile of your project?

   persons per home

8. What is the anticipated average auto ownership within one mile of your project?

   vehicles per home

4.2.2 Proximity to Alternative Modes of Transportation

9. What is the approximate distance to the nearest bicycle facility?

   miles

10. What is the approximate distance to the nearest transit facility?

    miles

4.2.3 VMT Generation Potential

11. Has a detailed transportation assessment, consistent with the City's Transportation Impact Analysis (TIA) Guidelines, been completed for your project?

☐ Yes ☐ No If yes, complete Section 4.2.3 using the transportation assessment as a guide. If no, precede to Section 4.3.

12. What is your project's anticipated raw trip generation[19]?

trips

13. What is your project's anticipated net vehicle trip generation[20]?

trips

14. What is your project's anticipated daily VMT[21]?

VMT

4.3 Energy

4.3.1 Electricity Usage

15. What is the project's estimated total annual electricity consumption at project build-out (i.e. once the project is fully operational)?

Kilowatt-hours per year

☐ N/A, the project will not consume electricity (precede to Section 4.3.2)

4.3.2 Fossil Fuel Usage

16. What is the project's estimated total annual natural gas consumption at project build-out (i.e. once the project is fully operational)?

Cubic feet per year

☐ N/A, the project will not consume natural gas (precede to Section 4.3.3)

17. Will any other fossil-fuel based on-site energy be consumed by the proposed project?

☐ Yes ☐ No If yes:

b. Please provide the type and annual quantity consumed.

[19] Raw trip generation estimates should be developed using standard trip generation sources, such as the City's Travel Demand Model, Trip Generation (ITE, 8th Edition), or locally valid rates.

[20] The net vehicle trip generation should account for internalize trips within a project area, trips made by non-autos, and pass-by trips (i.e. vehicles already on the roadway system that stop at the project as part of an already planned trip).

[21] VMT calculations should be performed assuming build-out of the current General Plan land uses and roadway network, as the characteristics of proximate land uses could affect the trip characteristics of a proposed project.

4.3.3 Renewable Power Options

18. Will your project incorporate on-site solar power?

☐ Yes ☐ No If yes:

a. What percentage of your annual building energy use will be supplied by power generated by the solar panels?

%

19. Will your project incorporate on-site wind power?

☐ Yes ☐ No If yes:

a. What percentage of your annual building energy use will be supplied by power generated by the wind turbine(s)?

%

20. Will your project incorporate renewable energy, other than wind or solar?

☐ Yes ☐ No If yes:

a. Please list the type of renewable energy (e.g., biomass) and percentage of your annual building energy use that will be supplied by renewable resource.

Type of renewable energy project

%

21. Will your project incorporate co-generation?

☐ Yes ☐ No If yes:

a. What percentage of your annual building energy use will be supplied by power generated by the co-generation facility?

%

22. Will your project offset energy consumption through the purchase of off-site renewable energy credits?

☐ Yes ☐ No If yes:

a. What percentage of your annual building energy use will be offset through the purchase of renewable energy credits?

%

4.3.4 Energy Efficiency and Green Building

23. Is your project subject to the City's Non-Residential Cool Roofs Standard?[22]

[22] For more information, please see http://www.stocktongov.com/cd/pages/documents/2010Non-residentialCoolRoof.pdf

☐ Yes ☐ No If yes:

a. Please provide a summary of your project's compliance with the standard (e.g., reflectance, SRI, etc.).

24. Please provide a summary of your project's compliance with the City's Green Building Ordinance (Chapter 15.72)[23]. For example, compliance with the California Green Buildings Standards Code, Title 24, Part 11 (CALGreen); 30% increase in energy efficiency; etc.

25. Will your project achieve LEED certification?

☐ Yes ☐ No If yes:

a. Please provide the number of buildings to be certified and the level of certification (e.g., bronze, silver, gold, or platinum).

26. Will typical builder-supplied appliances (e.g., refrigerators and dish washers) be ENERGY STAR certified (residential buildings)?

☐ Yes ☐ No

27. By what percentage will your project exceed current Title 24 Building Energy Standards?

%

28. What percentage of your project's outdoor lighting fixtures will be energy efficient bulbs (e.g., LED)?

%

29. Please describe your project's use of solar orientation and shade trees.

4.4 Water

30. What is the project's annual water demand at project build-out (i.e. once the project is fully operational)?

Acre-feet per year

☐ N/A, the project will not consume water (precede to Section 4.5)

31. Will your project develop and implement a landscape plan[24] to reduce annual outdoor water consumption?

[23] For more information, please see http://qcode.us/codes/stockton/

☐ Yes ☐ No If yes:

a. Please describe the features of the plan, including water budgets, vegetation species, irrigation acreage, etc.

32. Will your project implement CALGreen voluntary measures for water-efficiency?

☐ Yes ☐ No If yes:

a. Please describe the measures to be incorporated into building design (e.g., water-efficient appliances, pluming, irrigation systems, etc.).

33. Will your project include any additional water-efficiency measures not already described in this section (e.g., rainwater collection systems, water meters, etc.)?

☐ Yes ☐ No If yes:

a. Please describe the water-efficiency measures.

4.5 Waste

4.5.1 Solid Waste Generation

34. What is the project's estimated total annual waste generation (i.e. once the project is fully operational)?

Short tons

☐ N/A, the project will not generate any waste or wastewater (precede to Section 4.6)

35. Will the project have a recycling program?

☐ Yes ☐ No If yes:

c. What percentage of the project's total annual waste generated will be recycled?

%

36. Will the project have a composting program?

☐ Yes ☐ No If yes:

---

[24] Please note that as of January 2010, the City of Stockton Water Efficiency Ordinance requires preparation of a landscape plan and establishment of water budgets for irrigated landscape greater than 2,500 square feet.

d. What percentage of the project's total annual waste generated will be composed?

%

37. Will the project have a waste diversion program in addition to recycling and composting?

☐ Yes ☐ No If yes:

e. What percentage of the project's total annual waste generated will be diverted in addition to recycling and composting?

%

4.5.2 Solid Waste Landfills

38. Will the landfill where the project's waste is deposited have a methane capture system (refer to Attachment A for a list of landfills that have historically served the Stockton area)?

☐ Yes ☐ No If yes:

a. What is the percent methane capture efficiency at the landfill (if unknown, assume a default methane capture efficiency of 75%)?

%

4.5.3 Liquid Waste (wastewater)

39. What is the project's estimated total population[25] (i.e. once the project is fully operational)?

People

40. Will some or all of project-generated wastewater be treated in septic systems?

☐ Yes ☐ No If yes:

b. How many people will be served by septic systems?

People

4.6 Land Cover

4.6.1 Vegetation Planting

41. Will the project involve the planting of trees?

☐ Yes ☐ No If yes:

a. Please check the type of tree and provide the total acres or number of units estimated for planting.

[25] Total population is defined as the number of people that will generate wastewater as a result of the proposed project. For example, if the project will construction a 50 unit single family housing complex, and the average household size is 3 individuals, the total population of the project is 150 persons.

☐ Deciduous (e.g., Cottonwood etc.): acres planted or trees planted

☐ Evergreen (e.g., Oak, Pine, etc.): acres planted or trees planted

42. Will the project involve the planting of other vegetation?

☐ Yes ☐ No If yes:

a. Please check the type of vegatation and provide the total acres estimated for planting.

☐ Shrubs: acres planted

☐ Grass: acres planted

☐ Pasture: acres planted

☐ Crop: acres planted

☐ Wet soil plants (e.g., cattail); acres planted

☐ Water plants: acres planted

☐ Other: acres planted of species

4.6.2 Total Emissions

43. Has an EIR been completed and/or a GHG inventory been completed for your project?

☐ Yes ☐ No If yes:

a. What are the total annual operational-related GHG emissions quantified by the project's environmental document?

Metric Tons Carbon Dioxide Equivalent per year

Section 5
Operational Best Management Practices

5.1 Instructions to the Project Applicant

The purpose of this section is to introduce BMPs that can be implemented to reduce operational-related GHG emissions. Each BMP is given a score based on its GHG reduction potential (discussed in Section 6). It is important to note that these points cannot be added to the construction BMP points. The percent reduction from total operation emissions is independent from construction emissions.

It is not intended, and likely not possible, for all projects to adhere to all of the BMPs listed in this section. Moreover, not all the BMPs will be applicable to every project (e.g., water conservation measures will not apply to transportation projects). These BMPs therefore provide a portfolio of options from which a project applicant could choose the most appropriate to their particular project and sources of GHG emissions.

The operational BMPs focus on the following categories.

- **Transportation.** These measures reduce GHG emissions by reducing VMT generated by individuals traveling to and from the project site.
- **Energy.** These measures reduce GHG emissions through improvements in building energy efficiency and utilization of renewable resources.
- **Water.** These measures target GHG reductions by reducing project-related water consumption through improvements in fixture efficiency and conservation.
- **Waste.** These measures seek to reduce GHG emissions by reducing project-related waste generation, as well as encouraging the diversion of waste and wastewater to facilities with methane capture.
- **Land Cover.** These measures improve carbon sequestration through re-vegetation and the creation or preseveration of open spaces.

Transportation and energy measures are primarily drawn from the SJVAPCD Interim GHG Emissions Reduction Calculator (San Joaquin Valley Air Pollution Control District 2010). This calculator contains a series of BPS and their estimated carbon dioxide reduction potential.[26] Project applicants are encouraged to use the calculator (Available on SJVAPCD web site at: http://www.valleyair.org/programs/CCAP/ghg/ghg_idx.htm) to review potential GHG reductions associated with specific measures. Those measures drawn from the Emissions Reduction Calculator are marked with an asterisk (*).

For measures related to water, waste, and land cover, the City relied on current guidance from the EPA (2008), the CA AGO (2010), CAPCOA (2010), and prior project experience gained by ICF in developing these BMPs. The operational BMPs are organized and presented in the same way as construction BMPs.

[26] Per the SJVAPCD's GHG reduction targets, projects must comply with BPS or demonstrate a 29% reduction in GHG emissions, relative to business-as-usual conditions.

5.1.1 Transportation

5.1.1.1 Quantifiable BMPs

Bicycle and Pedestrian Facilities

BMP-19: Bicycle Parking*

Description

Require non-residential developments to provide a minimum ratio of one bike rack space per 20 vehicle spaces at short-term facilities and a minimum ratio of one long-term bicycle storage space per 20 employee parking spaces at long-term facilities. Require multi-unit residential developments to provide one long-term bicycle parking space for each unit without a garage (SJVAPCD 2010).

Bicycle parking at residential and non-residential facilities reduces VMT by providing options for alternative modes of transportation. SJVAPCD has quantified emissions reductions associated with this measure based on the Center for Clean Air Policy (CCAP) guidebook, which attributes a 1% to 5% reduction in VMT to the use of bicycles.

Co-Benefits

Co-benefits of this measure include reduced criteria pollutants generated by vehicle use, improved community awareness, and Leadership in Energy and Environmental Design (LEED) certification credit.

GHG Reduction Score

- 0.6.

BMP-20: End-Use Facilities*

Description

Provide "end-of-trip" facilities including showers, lockers, and changing space in the following ratio: four clothes lockers and one shower provided for every 80 employee parking spaces (SJVAPCD 2010).

End of use facilities encourage employees and the general public to walk, bike, or run to their final destination, thereby reducing VMT and GHG emissions.

Co-Benefits

Co-benefits of this measure include reduced criteria pollutants generated by vehicle use, improved community awareness, and LEED certification credit.

GHG Reduction Score

- 0.6.

BMP-21: Bicycle Lanes*

Description

Locate the project within 0.5 mile of existing Class I or Class II bike lanes and include access points from the proposed project to the existing facilities[27]. As applicable, require all streets internal to the proposed project wider than 75 feet to have Class II bicycles lanes on both sides (SJVAPCD 2010).

Bicycle lanes provide a continuous network of routes for bicyclists, which can help reduce peak-hour VMT and GHG emissions.

Co-Benefits

Co-benefits of this measure include reduced criteria pollutants, traffic congestion, and parking pressure, as well as increased community awareness and support.

GHG Reduction Score

- 0.6.

BMP-22: Pedestrian Network*

Description

Provide a pedestrian access network that internally links all uses and connects to existing or planned external streets and pedestrian facilities within and off the project site (SJVAPCD 2010).

Providing a continuous pedestrian network helps remove barriers to pedestrian access and interconnectivity (BMP-24). It encourages a person to walk or jog instead of driving, which reduces GHG emissions.

Co-Benefits

Co-benefits of this measure include reduced criteria pollutants, traffic congestion, and parking pressure, as well as increased community awareness and support.

GHG Reduction Score

- 0.8.

BMP-23: Remove Pedestrian Barriers*

Description

Remove physical barriers, such as walls, berms, landscaping, and slopes between residential and non-residential uses (SJVAPCD 2010).

Site design and building placement minimize barriers to pedestrian access and interconnectivity. Physical barriers impede bicycle or pedestrian circulation, which reduce the likelihood of these alternative modes of transportation from being utilized. Note that removal of physical barriers should not compromise public safety or aesthetics.

[27] SJVAPCD defines existing facilities as those facilities that are physically constructed and ready for use prior to the first 20% of the project's occupancy permits being granted.

Co-Benefits

Co-benefits of this measure include reduced criteria pollutants, traffic congestion, and parking pressure, as well as increased community awareness and support.

GHG Reduction Score

- 1.0.

Public Transit Improvements

BMP-24: Public Transit Shelters*

Description

Provide safe and convenient bicycle/pedestrian access to existing and/or planned transit stop(s)[28] and provide essential public transit stop improvements (i.e., shelters, route information, benches, and lighting) (SJVAPCD 2010).

Convenient access to public transit stops increases the likelihood of individuals utilizing public transit service instead of single-occupancy vehicles.

Co-Benefits

Co-benefits of this measure include reduced criteria pollutants, traffic congestion, and parking pressure, as well as increased community awareness and support.

GHG Reduction Score

- 0.4.

Site Design and Land Use Planning Features

BMP-25: High-Density Non-Residential Development*

Description

Require office and mixed-use developments to be high density and in close proximity to existing and planned transit service, rapid transit, or light rail (SJVAPCD 2010).

Increasing density affects the distance people travel between various destinations, including public transit stations. Increased density also provides the foundation to implement other transportation-related measures. For example, public transit ridership will increase with higher density planned near public transit service, thereby justifying improved access to existing and/or planned public transit stops (BMP-34).

Co-Benefits

Co-benefits of this measure include reduced criteria and toxic air pollutants, traffic congestion, and parking pressure.

[28] This measure assumes the bus or streetcar provides headways of one hour or less for stops within 0.25 mile.

GHG Reduction Score

- Floor-to-area ratio (FAR) [29] is ≥ 0.75 and < 1.5: 0.5.
- FAR is ≥ 1.5 and < 2.25: 0.6.
- FAR is ≥ 2.25: 0.9.

BMP-26: High-Density Residential Development*

Description

Require residential developments to be high density and in close proximity to existing and planned public transit, rapid transit, or light rail services (SJVAPCD 2010).

High-density development near public transit centers can decrease commute-related VMT because residents are more likely to take public transit than to use single-occupancy vehicles to commute. High-density development can also reduce energy use due to shared infrastructure and services.

Co-Benefits

Co-benefits of this measure include reduced criteria and toxic air pollutants, traffic congestion, and parking pressure.

GHG Reduction Score

- Density[30] is ≥ 7 and < 10 dwelling units per acre (du/ac): 1.9.
- Density is ≥ 11 and < 20 du/ac: 3.9.
- Density is ≥ 21 and < 30 du/ac: 5.9.
- Density is ≥ 31 and < 40 du/ac: 6.9.
- Density is ≥ 41 and < 50 du/ac: 8.9.
- Density is ≥ 50 du/ac: 10.9.

BMP-27: Urban Mixed-Use Design*

Description

For urban mixed-use projects, require a jobs-to-housing ratio greater than 0.5 (SJVAPCD 2010).

Improving the jobs-to-housing ratio can decrease commute-related VMT because trips between work and home are shorter and might be accommodated by non-motorized modes of transport.

Co-Benefits

Co-benefits of this measure include reduced criteria and toxic air pollutants, traffic congestion, and parking pressure.

[29] Density is based on the FAR.

[30] Density is calculated by determining du/ac within the residential portion of the project's net lot area.

GHG Reduction Score

- Jobs-to-housing ratio is ≥ 0.5 and < 1.0: 3.0.
- Jobs-to-housing ratio is ≥ 1.0 and < 1.5: 6.6.
- Jobs-to-housing ratio is ≥ 1.5 and < 2.0: 9.0.
- Jobs-to-housing ratio is ≥ 2.0 and < 2.5: 7.3.
- Jobs-to-housing ratio is ≥ 2.5 and < 3.0: 6.0.
- Jobs-to-housing ratio is ≥ 3.0: 4.6.

BMP-28: Suburban Mixed-Use Design*

Description

Provide at least three of the following on-site and/or off-site within 0.25 mile of each other: residential development, retail development, park, open space, or office (SJVAPCD 2010).

Mixed-use design affects the distance people travel between various destinations, including public transit stations. Residents and workers are also more likely to take mass transit or utilize non-motorized methods of travel, such as walking and biking.

Co-Benefits

Co-benefits of this measure include reduced criteria and toxic air pollutants, traffic congestion, and parking pressure.

GHG Reduction Score

- 3.0.

BMP-29: Other Mixed-Use Design*

Description

Ensure that all residential units are within 0.25 mile of parks, schools or other civic uses (SJVAPCD 2010).

As discussed above, mixed-use design affects the distance people travel between various destinations, including public transit stations. Residents and workers are also more likely to take public transit or utilize non-motorized methods of travel, such as walking and biking.

Co-Benefits

Co-benefits of this measure include reduced criteria and toxic air pollutants, traffic congestion, and parking pressure.

GHG Reduction Score

- 1.0.

BMP-30: Orientation Toward Alternative Transportation*

Description

Orient the proposed project toward existing and/or proposed public transit, bicycle, or pedestrian corridors. This measure includes minimizing the setback distance between the project and adjacent uses (e.g., buildings, sidewalks), as well as facing buildings toward the street frontage (SJVAPCD 2010).

Orientation toward alternative transportation can decrease commute-related VMT because residents are more likely to take public transit or use non-motorized transportation than to commute using single-occupancy vehicles.

Co-Benefits

Co-benefits of this measure include reduced criteria and toxic air pollutants, traffic congestion, and parking pressure.

GHG Reduction Score

- 0.4.

BMP-31: Street Grid Development*

Description

As appropriate, design the proposed project to include multiple and direct street routing. The measure applies only to projects with an internal connectivity factor (CF) greater than 0.80 and an average of 0.25 mile or less between external connections along the perimeter of the project (SJVAPCD 2010).

Street routing can increase traffic flow and decrease congestion, resulting in shorter travel times, greater vehicle fuel efficiency and reduced GHG emissions from vehicles.

Co-Benefits

Co-benefits of this measure include reduced criteria and toxic air pollutants and reduced traffic congestion.

GHG Reduction Score

- 1.0.

BMP-32: Affordable Housing*

Description

For residential development projects of five or more dwelling units, provide a deed-restricted low-income housing component as part of the proposed project (SJVAPCD 2010).

Income is directly correlated to public transit ridership. Providing affordable housing units enables low-income families to live closer to job centers and public transit services.

Co-Benefits

Co-benefits of this measure include reduced criteria and toxic air pollutants, traffic congestion, and parking pressure.

GHG Reduction Score

- 15% of the dwelling units are deed restricted: 0.6.
- 20% of the dwelling units are deed restricted: 0.8.
- 30% of the dwelling units are deed restricted: 1.2.
- 40% of the dwelling units are deed restricted: 1.6.
- 50% of the dwelling units are deed restricted: 2.0.
- 60% of the dwelling units are deed restricted: 2.4.
- 70% of the dwelling units are deed restricted: 2.8.
- 80% of the dwelling units are deed restricted: 3.2.
- 90% of the dwelling units are deed restricted: 3.6.
- 100% of the dwelling units are deed restricted: 4.0.

Trip-Reducing Actions (Including Parking Restrictions)

BMP-33: Traffic Calming*

Description

Include pedestrian/bicycle safety and traffic-calming measures, such as bike lanes, center islands, closures (cul-de-sacs), diverters, education, forced turn lanes, roundabouts, and speed humps (SJVAPCD 2010).

Roadways with traffic-calming measures are designed to encourage pedestrian and bicycle trips by reducing motor vehicle speeds. GHG reductions are dependent on the percentage of streets that include traffic-calming measures (e.g., 25% of intersections include traffic-calming measures).

Co-Benefits

Co-benefits of this measure include reduced criteria and toxic air pollutants and reduced traffic congestion.

GHG Reduction Score

- 0.6.

BMP-34: Neighborhood Electric Vehicles*

Description

Include the necessary infrastructure for neighborhood electric vehicles (NEV)[31] (e.g., charging stations, striping, parking). Connect internal NEV facilities to other existing NEV networks outside the project area (SJVAPCD 2010).

Providing electric vehicle infrastructure incentivizes residents and businesses to purchase and utilize electric vehicles. Electric vehicles replace vehicles powered by conventional fossil fuels, thereby reducing GHG emissions from fuel combustion. Because electric vehicles produce zero emissions, GHG emissions can be cut by 100%.[32]

Co-Benefits

Co-benefits of this measure include reduced criteria and toxic air pollutants and reduced traffic congestion.

GHG Reduction Score

- 1.0.

BMP-35: Parking Fees*

Description

Institute employee and/or customer parking fees for those facilities within 0.25 mile of existing or planned transit (SJVAPCD 2010).

This measure discourages gasoline-powered trips by charging a fee for parking. The parking fee should be equal to or greater than the cost of a local public transit pass. This measure might require City action to implement because it might not be within the ability of an individual project proponent.

Co-Benefits

Co-benefits of this measure include reduced criteria and toxic air pollutants, traffic congestion, and parking pressure.

[31] NEVs are classified in the California Vehicle Code as *low-speed vehicles.* They are electric powered and ideal for short trips up to 30 miles in length.

[32] There are emissions associated with the electricity required to power electric vehicles, but such emissions are much smaller on a per-mile basis than those attributable to conventional vehicles.

GHG Reduction Score

- 2.8.

BMP-36: Parking Limits*

Description

Provide the minimum outlined in the local zoning code (SJVAPCD 2010).[33]

Minimum parking provides an incentive to use alternative modes of transportation that don't require parking, such as public transit, walking, and biking.

Co-Benefits

Co-benefits of this measure include reduced criteria and toxic air pollutants and reduced traffic congestion and parking pressure.

GHG Reduction Score

- 4.5.

BMP-37: Parking Lot Design*

Description

Design parking lots to include clearly marked and shaded pedestrian pathways between public transit facilities and building entrances. Pathways must connect to all public transit facilities internal or adjacent to project site (SJVAPCD 2010).

Pedestrian pathways such as these might increase the use of public transit.

Co-Benefits

This measure might also reduce criteria and toxic air pollutants and reduce traffic congestion and parking pressure.

GHG Reduction Score

- 0.5.

BMP-38: Off Street Parking*

Description

Prohibit parking facilities from being adjacent to street frontage (SJVAPCD 2010).

Off-street parking provides a visual incentive for individuals to use alternate modes of transportation.

Co-Benefits

This measure might also reduce criteria and toxic air pollutants and reduce traffic congestion and parking pressure.

[33] This measure requires special review of local zoning codes.

GHG Reduction Score

- 0.8.

5.1.1.2 Supporting BMPs

No supporting BMPs have been identified.

5.1.2 Energy

5.1.2.1 Quantifiable BMPs

Energy Efficiency

BMP-39: Exceed Title 24*

Description

Exceed the current Title 24 Standards[34] by 15% in all new residential and commercial developments (SJVAPCD 2010).

This can be accomplished through a portfolio of design options selected on a project-by-project basis. Resources for identifying and selecting the most appropriate building design options for minimizing energy consumption are available through the California Buildings Standards Commission (Green Buildings Standards)[35], the U.S. Department of Energy (Building Technologies Program)[36], the U.S. Green Building Council LEED Program,[37] or other resources as appropriate.

Co-Benefits

Co-benefits of this measure include cost savings from reduced electricity use due to building-wide efficiency gains.

GHG Reduction Score

- 1.0.

BMP-40: Solar Orientation*

Description

Implement or exceed CALGreen's voluntary measure for building orientation in order to optimize conditions for natural heating, cooling, and day lighting of interior spaces, and to maximize winter sun exposure (SJVAPCD 2010).

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[34] California's Energy Efficiency Standards for Residential and Non-Residential Buildings, Title 24, Part 6 of the California Code of Regulations. The Title 24 Code includes instructions for energy savings calculations and is available at http://www.energy.ca.gov/title24/. This standard represents the minimum level of energy efficiency that should be achieved by new construction in California. These standards are updated every 3 years, so the term "current" reflects the standards in place at the time of development.

[35] Available at http://www.bsc.ca.gov/CALGreen/default.htm

[36] Available at http://www1.eere.energy.gov/buildings/building_america/publications.html.

[37] Available at http://www.usgbc.org/DisplayPage.aspx?CategoryID=20

Within the San Joaquin Valley, buildings should be oriented to face within 30 degrees of north or south. Such orientation will reduce the amount of electricity and natural gas needed to condition the air within buildings.

Co-Benefits

Co-benefits of this measure include cost savings from reduced electricity use for air conditioning and heating. This measure might also reduce natural gas consumption for heating purposes, resulting in cost savings and reduced criteria pollutant emissions from natural gas combustion.

GHG Reduction Score

- 0.5.

BMP-41: Reflectivity of Non-Roof Surfaces*

Description

Use light colored/high albedo materials (reflectance of at least 0.3) and/or open-grid pavement for at least 30% of non-roof surfaces. Implement or exceed CALGreen's voluntary measures to reduce non-roof and roof heat islands (SJVAPCD 2010).

Non-roof surfaces reduce heat islands (thermal gradient differences between developed and undeveloped open areas) to minimize the impact on microclimate and human and wildlife habitat.

Co-Benefits

Co-benefits of this measure include cost savings from reduced electricity use for air conditioning and increased livability.

GHG Reduction Score

- 1.0.

BMP-42: Green Roofs*

Description

Install a vegetated roof that covers at least 50% of roof area (SJVAPCD 2010).[38]

Vegetated roofs can reduce electricity needed for air conditioning and heating in buildings because they provide natural insulation and reflectivity. Vegetated roofs also sequester carbon from the atmosphere.

Co-Benefits

Co-benefits of this measure include cost savings from reduced electricity use for air conditioning and heating. This measure might also reduce natural gas consumption for heating purposes, resulting in cost savings and reduced criteria pollutant emissions from natural gas combustion.

[38] This measure will require consideration of the climate and irrigation requirements.

GHG Reduction Score

- 0.5.

BMP-43: Energy Star Roof*

Description

Install roof materials and other typical builder-supplied appliances (e.g., refrigerators and dish washers) that are Energy Star certified (SJVAPCD 2010).

Energy Star–certified roof products reflect more of the sun's rays, decreasing the amount of heat transferred into a building. During the hot summers in the San Joaquin Valley, this measure will help cool buildings and contribute to reductions in air conditioning use. Likewise, Energy Star–certified appliances use less energy than traditional appliances use.

Co-Benefits

Co-benefits of this measure include cost savings from reduced electricity use needed for air conditioning and appliances.

GHG Reduction Score

- 0.5.

BMP-44: Energy Star Appliances

Description

For residential projects, require that typical builder-supplied appliances (e.g., refrigerators, dish washers, clothes washers, and ceiling fans) are Energy Star certified (CAPCOA 2010).

Energy Star–certified appliances use less energy than traditional appliances use.

Co-Benefits

Co-benefits of this measure include cost savings from reduced electricity use needed for air conditioning and appliances.

GHG Reduction Score

- 0.2.

BMP-45: Lighting Standards

Description

Require development utilize energy-efficient lighting (e.g., light-emitting-diode [LED] bulbs, Energy Star–certified lighting[39]) in at least 50% of outdoor lighting fixtures (ICF professional experience).

LED bulbs and Energy Star–certified lighting are more efficient than standard incandescent and fluorescent lighting, saving electricity and money for the building owner.

[39] Energy Star-certified lighting can use up to 75% less energy than standard lighting.

Co-Benefits

Co-benefits of this measure include cost savings from reduced electricity for lighting purposes.

GHG Reduction Score

- 0.2.

BMP-46: Solar Water Heaters

Description

Require that water be heated with solar water heaters for at least 50% of development. For residential development, require 50% of hot water to be supplied by solar heaters. For commercial development, require 25% of hot water to be supplied by solar heaters (CAPCOA 2010).

Co-Benefits

Co-benefits of this measure include cost savings from reduced electricity and natural gas used for water heating. This measure might also reduce criteria pollutant emissions from natural gas combustion.

GHG Reduction Score

- 0.3.

Renewable Energy

BMP-47: Onsite Renewable Energy*

Description

Provide onsite renewable or carbon-neutral energy systems in both residential and commercial developments. At least 12.5% of total energy costs must be supplied by the renewable energy system(s) (SJVAPCD 2010).

Using energy generated by renewable energy displaces electricity demand that would ordinarily be supplied by the local utility. For single installation, on-site solar is currently the preferred option for cost, power generation and general feasibility. However, technological developments and unique site considerations (e.g., wind resources, proximity to geothermal or tidal power sources, limited solar generating capacity) might make other renewable power sources preferable in the future.

Co-Benefits

This measure can reduce costs associated with energy purchases because utility-bought power is offset by renewable power. Other co-benefits of this measure might include reduced criteria pollutant emissions from natural gas combustion.

GHG Reduction Score

- 1.0.

5.1.2.2 Supporting BMPs

BMP-48: Roofing Materials

Description

Require light-colored roofing of materials exceeding the reflectivity requirements of Title 24 (material will have an initial thermal emittance greater than or equal to 0.75 when tested in accordance to Title 24 protocols) (ICF professional experience).

Because such "cool roofs" save both energy and money, performance standards for their installation have been included in Title 24. Title 24, Section 10-113 provides specifications for liquid coatings, insulation, labeling, and building envelope requirements.

Co-Benefits

Co-benefits of this measure include cost savings from reduced electricity use needed for air conditioning.

GHG Reduction Score

- Moderate.

5.1.3 Water

5.1.3.1 Quantifiable BMPs

Water Use Efficiency

BMP-49: CALGreen Voluntary Measures

Description

Implement CALGreen voluntary measures for water-efficient appliances, plumbing and irrigation systems, and water savings targets. Require a 30–40% reduction over baseline in indoor water use and a 55–60% reduction over baseline outdoor potable water use (ICF professional experience).

In 2010, the California Building Standards Commission unanimously adopted Title 24 Part 11 (also known as CALGreen), the mandatory green building standards code and the first such code in the nation. CALGreen requires all new buildings in the state to be more energy efficient and environmentally responsible. Effective January 1, 2011, CALGreen requires that every new building constructed in California reduce water consumption by 20%. CALGreen voluntary measures recommend the aforementioned 30–40% reduction over baseline in indoor water use and 55–60% reduction over baseline outdoor potable water use. Co-Benefits

Co-benefits of this measure include cost savings from reduced water purchases.

GHG Reduction Score

- 0.1.

BMP-50: Low-Flow Fixtures

Description

Install low-flow fixtures (e.g., toilets, urinals, showerheads, and faucets) in all residential and non-residential development in place of conventional fixtures (CAPCOA 2010).

Low-flow fixtures and aerators use high pressure and aeration to produce a comfortable, pleasing flow without using nearly as much water. Low-flow fixtures can reduce water use by 25%–60% over conventional fixtures.

Co-Benefits

Co-benefits of this measure include cost savings from reduced water purchases.

GHG Reduction Score

- 0.2.

BMP-51: Water-Efficient Landscapes

Description

Design new residential, commercial, and industrial development to include water-efficient landscapes. For example, reduce lawn sizes, plant vegetation with minimal water needs, choose vegetation appropriate to the climate, and choose complimentary plants that have similar water needs or can provide each other with shade and water (CAPCOA 2010).

Water-efficient landscapes require much less water for irrigation purposes, and can be easier to maintain.

Co-Benefits

Co-benefits of this measure include cost savings from reduced water purchases, smaller irrigation systems, and water quality improvements.

GHG Reduction Score

- 0.1.

BMP-52: Smart Irrigation Control Systems

Description

Install smart irrigation control systems to reduce outdoor water consumption (CAPCOA 2010).

Smart irrigation control systems use weather, climate, and/or soil moisture data to automatically adjust watering schedules in response to environmental and climate changes, such as changes in temperature or precipitation levels (CAPCOA 2010).[40]

[40] For more information, refer to http://www.irrigationtutorials.com/faq/smart-controllers.htm

Co-Benefits

Co-benefits of this measure include cost savings from reduced water purchases and water quality improvements.

GHG Reduction Score

- 0.1.

Alternative Water Sources

BMP-53: Gray Water

Description

Require new buildings to use gray water for outdoor water uses (CAPCOA 2010).

Gray water differs from reclaimed water in that it is untreated water generated by bathtubs, showers, faucets, and washing machines that is collected and redistributed on the site. It does not require treatment or energy to redistribute.

Co-Benefits

Co-benefits of this measure include cost savings from reduced water purchases, reduced energy use associated with importing potable water, and drought protection.

GHG Reduction Score

- 0.2.

5.1.3.2 Supporting BMPs

Water Use Efficiency

BMP-54 Native Landscaping

Description

Plant native and/or drought-resistant vegetation in all residential and non-residential landscapes (CAPCOA 2010).

California native plants typically require less water for irrigating than nonnative plants require because they are accustomed to the climate zone and ecotype. Planting native species might also contribute to additional benefits, including reducing the need for fertilization and pesticide use, and providing a more natural habitat for wildlife.[41]

Co-Benefits

Co-benefits of this measure include cost savings from reduced water purchases, landscaping activities, and water quality improvements.

[41] For more information on native species, refer to http://www.epa.gov/greenacres/navland.html#Introduction.

GHG Reduction Score

- Low.

BMP-55: Low-Impact Development

Description

Implement low-impact development (LID) measures as proposed by the Office of Planning and Research (Office of Planning and Research 2009).[42]

LID is an alternative method of land development that seeks to maintain the natural hydrologic character of the site or region. LID accomplishes this through source control, retaining more water on the site where it falls, rather than using traditional methods of funneling water through pipes into local waterways. Both improved site design and specific management measures are utilized in LID designs. LID has been applied to government, residential, and commercial development and redevelopment, and has proven to be a cost-effective and efficient method for managing runoff and protecting the environment.

Co-Benefits

Co-benefits of this measure include cost savings from reduced water purchases, runoff management, environmental protection, and water quality improvements.

GHG Reduction Score

- Moderate.

5.1.4 Waste

5.1.4.1 Quantifiable BMPs

Waste Reduction and Diversion

BMP-56: Institute Recycling Services

Description

Reduce the amount of waste sent to landfills by implementing a recycling service for the project. Require 75% of all recyclable material generated by the project to be recycled instead of landfilled (recycling goals can also be specified in terms of total waste, such as recycle 30% of total waste). Provide easy and convenient recycling opportunities for residents, the public, and tenant businesses (CAPCOA 2010; ICF professional experience).

Recycling can reduce landfill methane emissions. According to CARB, recycling can result in a GHG reduction of 0.2 to 12.9 $MTCO_2e$ per ton of material, depending on material type (CARB 2010)[43]. Recycling materials also replaces virgin inputs in the manufacturing process, reducing energy use and lifecycle emissions associated with manufacturing.

[42] Resources and information available http://www.opr.ca.gov/ceqa/pdfs/Technical_Advisory_LID.pdf and http://www.opr.ca.gov/planning/docs/State_Agency_Technical_Resources_for_General_Plans.pdf

[43] The 0.2 value is for glass; the 12.9 value is for aluminum. Recycling mixed plastics, cardboard, and office paper can result in a GHG reduction of 1.2, 5.0, and 4.3 $MTCO_2e$/ton of material, respectively.

Co-Benefits

This measure might reduce waste-hauling and tipping fees, as well as fuel combustion emissions for transporting waste to landfills.

GHG Reduction Score

- 0.7.

BMP-57: Institute Composting Services

Description

Reduce the amount of waste sent to landfills by implementing a composting service for the project. Require 75% of all compostable material generated by the project to be composted instead of landfilled (composting goals can also be specified in terms of total waste, such as compost 15% of total waste). Provide easy and convenient composting opportunities for residents, the public, and tenant businesses (CAPCOA 2010; ICF professional experience).

Composting organic waste material can reduce GHG emissions by decreased landfill methane emissions or decreased combustion emissions. According to CARB, composting can result in a GHG reduction of 0.42 $MTCO_2e$ per ton of feedstock (CARB 2010). Composting can also help offset synthetic fertilizers which can be more energy intensive than organic fertilizers and compost.

Co-Benefits

This measure might reduce waste-hauling and tipping fees, as well as fuel combustion emissions for transporting waste if the material is composted on the site.

GHG Reduction Score

- 0.7.

5.1.4.2 Supporting BMPs

Waste Reduction and Diversion

BMP-58: Institute Waste Reduction Services

Description

Institute practices that reduce waste and result in the purchase of fewer products wherever practicable and cost effective. For example, use double-sided photocopying and printing, use washable and reusable dishes and utensils, lease long-life products when service agreements support maintenance and repair rather than new purchases, and re-use products such as, but not limited to, file folders, storage boxes, office supplies, and furnishings (ICF professional experience).

Source reduction can reduce landfill methane emissions because less waste is generated and sent to the landfill. It can also reduce upstream emissions because less material is manufactured.

Co-Benefits

Co-benefits of this measure include cost savings associated with reduced product purchases. This measure might also reduce waste-hauling and tipping fees, as well as fuel combustion emissions for transporting waste to landfills.

GHG Reduction Score

- Moderate.

BMP-59: Public Education for Waste Management

Description

Provide education and publicity about reducing waste and available recycling services (ICF professional experience).

Many cities and counties provide information on waste reduction and recycling. See, for example, the Butte County Guide to Recycling (http://www.recyclebutte.net). The CalRecycle website contains numerous publications on recycling and waste reduction that might be helpful in devising an education project (http://www.calrecycle.ca.gov/ReduceWaste/). Private projects might also provide waste and recycling education directly, or fund education.

Co-Benefits

Co-benefits of this measure include cost savings associated with reduced product purchases, reduced waste-hauling and tipping fees, and reduced fuel combustion emissions for transporting waste to landfills.

GHG Reduction Score

- Low.

BMP-60: Environmentally Preferable Purchasing

Description

Purchase certain products with recycled content.[44] Require at least 30% recycled content for paper. Also use EPA's Environmentally Preferable Purchasing (EPP)[45] tools to reduce effects on human health and the environment (ICF professional experience). For example:

- Purchase materials and supplies with recycled content, such as building and construction materials, office supplies, and paper products.
- Purchase Energy Star[46]– or Water Sense[47]–certified products, or look for Electronic Product Environmental Assessment Tool (EPEAT) [48]–certified products when purchasing electronics.

[44] A requirement under section 6002 of the Resource Conservation and Recovery Act for recipients of federal funds, including their contractors.

[45] Multiple purchasing guides and materials ranking are available through the EPA (http://www.epa.gov/oppt/epp/) the California Integrated Waste Management Board (http://www.calrecycle.ca.gov/greenBuilding/), the National Institute for Building Sciences (http://www.wbdg.org/resources/greenproducts.php?r=env_preferable_products), and the California Green building Council (http://www.usgbc-ncc.org/index.php?option=com_content&task=view&id=174&Itemid=248).

[46] More information available at http://www.energystar.gov/

- Purchase products formulated with safer chemicals to reduce chemical exposures to workers and the public.

Give preference to sustainable and environmentally friendly building materials, including, but not limited to, materials with high post-consumer recycled content. EPP can also reduce upstream emissions because less material is manufactured.

Co-Benefits

Co-benefits of this measure include cost savings associated with reduced product purchases.

GHG Reduction Score

- Low.

5.1.5 Land Cover

5.1.5.1 Quantifiable BMPs

None identified.

5.1.5.2 Supporting BMPs

New Vegetation

BMP-61: Urban Tree Planting

Description

Implement a program to plant trees on the western side of new developments. The program should involve an annual goal for the number and species of trees to plant (CAPCOA 2010).

Planting trees on the western side of development in the San Joaquin Valley will reduce energy consumption from increased shade. The GHG benefits achieved from tree planting will vary based on the type of tree planted and the distance the tree is planted from the building.

Co-Benefits

Co-benefits of this measure might include increased sequestration of carbon dioxide while the trees are actively growing. The amount of carbon dioxide sequestered depends on the type, size, and age of the trees. In addition, the sequestration benefits will increase over time, with the maximum benefits achieved once the tree reaches maturity. Tree planting also has several other co-benefits, including improved natural water filtration, reduced runoff, flood control, and cleaner air. Trees also help create a more visually pleasing and attractive landscape.

[47] More information available at http://www.epa.gov/WaterSense/

[48] More information available at http://www.epeat.net/

GHG Reduction Score

- Low to Moderate.

Conservation

BMP-62: Land Conservation and Preservation

Description

Preserve forested areas, agricultural lands, wildlife habitat, wildlife corridors, wetlands, watersheds, groundwater recharge areas, and other open space that provide carbon sequestration benefits.[49] This can be achieved through the following practices: (1) avoiding emissions by maintaining existing carbon storage in trees and soils; (2) increasing carbon storage (e.g., tree planting) (3) substituting bio-based fuels and products for fossil fuels, such as coal and oil, and energy-intensive products that generate greater quantities of carbon dioxide when used (CAPCOA 2010; ICF professional experience).[50]

Co-Benefits

Co-benefits of this measure might include reduced energy consumption from shade tree effects, improved natural water filtration and reduced runoff, and visually pleasing landscaping.

GHG Reduction Score

- Low to Moderate.

BMP-63: Create New Vegetated Open Space

Description

Implement a program to re-vegetate or create vegetated land from previously settled land. Re-vegetating or creating vegetated land sequesters carbon dioxide from the atmosphere that would not have been captured had there been no land-type change (CAPCOA 2010).

Co-Benefits

Co-benefits of this measure might include reduced energy consumption from shade tree effects, improved natural water filtration and reduced runoff, and visually pleasing landscaping.

GHG Reduction Score

- Low to Moderate.[51]

[49] Preservation of these lands will most likely have to occur outside City limits where such lands are more prevalent. Please note magnitude of co-benefits achieved will decrease as a function of distance from the City. It is therefore recommended that all preservation activities occur within the greater Stockton area.

[50] See the EPA Carbon Sequestration in Agriculture and Forestry, Frequently Asked Questions (webpage) at http://www.epa.gov/sequestration/faq.html and the CARB Economic Sectors Portal, Forestry (webpage) at http://www.arb.ca.gov/cc/ghgsectors/ghgsectors.htm.

[51] The GHG reduction potential for this measure is ultimately dependent upon the number of acres created, the type of vegetation cover, and it sequestration profile.

Section 6
Best Management Practices Scorecard

6.1 Introduction

This section includes Construction and Operational BMP Scorecards. Each Scorecard provides an appraisal of the potential GHG reductions for the quantifiable BMPs described in Sections 3 and 5. The scoring system is based on GHG reduction potential only; cost, environmental co-benefits, and other considerations were not taken into account. The Scorecards can serve as a guide to estimating the magnitude of potential GHG emissions reductions achievable by selected BMPs.

As discussed in the Introduction to this document, actual GHG reduction benefits might vary on a project-by-project basis. The scores were quantified for a typical land use development where a score of 1 equals a 1% reduction in GHG emissions. However, differences in project characteristics between the quantified scenario and the proposed development limit application of this one-to-one ratio to individual projects. The scores presented below should therefore be viewed in general terms, where a score of 1 will likely correspond to fewer GHG reductions than a score of 10. Completion of Step 4 (refer to the Introduction to this document), which involves quantifying GHG reductions based on project-specific inputs, will help reduce this limitation.

Construction and operational points cannot be added because the points were calculated relative to the total emissions resulting from either construction or operation, not the net amount of emissions. For example, assume a construction project emits 1,000 $MTCO_2e$ in a year, while operation emits 10,000 $MTCO_2e$ in a year. A construction BMP point of 1 is equivalent to a 1% reduction in 1,000 $MTCO_2e$, or 10 $MTCO_2e$. An operational BMP point of 1 is equivalent to a 1% reduction in 10,000 $MTCO_2e$, or 100 $MTCO_2e$. The two points are not equivalent in terms of their weight, and therefore should not be added together.

The GHG reduction scores were calculated using a number of sources, including CAPCOA (2010) and SJVAPCD (2010). For measures not included in these documents, reductions were calculated based on ICF's professional experience with similar BMPs for CAPs and CEQA mitigation for construction and operation of development projects. As discussed in the Introduction to this document, combining multiple data sources introduces discrepancies in underlying assumptions and methodologies that might affect the final GHG reduction potential quantified for each BMP. However, potential error was reduced through careful review of the data sources and exclusion of incompatible information.

According to the SVJAPCD's GHG guidance, projects achieving a score of 29 through any combination of operational BMPs are considered to have a less-than-significant cumulative impact on climate change. This guidance applies only to operational emissions. However, the absence of a significance threshold for construction emissions does not obviate a project applicant's need to implement mitigation.[52] BMPs identified in the Construction Scorecard must therefore be considered by all projects.

[52] Pursuant to the 2011 State CEQA Guidelines, "lead agencies shall consider feasible means…of mitigating the significant effects of greenhouse gas emissions" (Section 15126.4(c).

If a measure is deemed infeasible, this determination be indicated on the Scorecard and a rationale must be provided in Attachment C. Acceptable rationales include:

- **Technical**. For example, it might be technically impossible to provide electric service to the project area to support fleet electrification.
- **Logistical.** For example, supplying electrical service to the project site might require use of adjacent lands, which are beyond the jurisdiction of the project applicant.
- **Environmental.** For example, supplying electrical service to the project site might require use of adjacent wetland and therefore result in a significant impact to biological resources.
- **Economic.** For example, utilizing alternative fuels might be cost prohibitive (note that if a measure is deemed cost prohibitive, sufficient justification regarding the anticipated increase in cost must be provided).
- **Applicability.** For example, BMP-11, which requires at least 25% of paving materials to be low energy intensive, could not apply to projects that do not involve paving.

6.2 Instructions to the Project Applicant

Applicants for development projects can utilize the Construction and Operational Scorecards as a guide to estimating the GHG emissions reduction potential of a project. Section 6.2.1, the Construction BMP Scorecard, lists the Construction BMPs described in Section 3, as well as the specific implementation requirements, while Section 6.2.2, the Operational BMP Scorecard, lists the Operational BMPs described in Section 5. As discussed, each BMP is assigned a score based on GHG reduction potential only (GHG Reduction Score). Please refer to Section 6.2.4 for a visual representation of GHG reductions achievable through each BMP.

For each BMP that your project will implement, copy the "GHG Reduction Score" into the corresponding "Project Score." For example, if your project were to implement BMP-3, the corresponding project construction score would be 1.0. Note that some measures have multiple scores depending on the level of implementation chosen by the applicant (e.g., BMP-1). For these measures, only copy the score that corresponds to the committed level of activity. For example, if 75% of your construction fleet will use alternative fuels, your project construction score for BMP-1 would be 16.5. If your project will not implement a specific BMP, please leave the "Project Score" blank.

At the conclusion of each emissions sector, add the project scores for each BMP in the emissions sector and place the added score in the shaded box. Place the total GHG reduction score at the conclusion of each table. This value represents your anticipated GHG reduction potential for the selected BMPs. Do not add the construction BMP score to the operation BMP score: the two scores are independent of one another. The operational BMP score should be reported in the environmental document to determine significance pursuant to SJVAPCD's GHG guidance.

Supporting measures indentified in Sections 3 and 5 are listed at the conclusion of the BMP Scorecards. Although GHG emissions reductions associated with these measures are not quantified in this packet, GHG emissions reductions for each BMP were evaluated qualitatively and identified as either "low," "moderate," or "high" based on professional judgment and experience. For each supporting measure that your project will implement, check the implementation box.

City staff can assist you if you have any difficulty completing the Scorecards. Refer to Attachment D for an example of completed Scorecards and the Supporting BMP Ranking Table.

6.2.1 Construction BMP Scorecard

Sector	BMP	Implementation Requirement	Reduction Score (% Reduction)	Project Score	BMP Infeasible[a]
Fuel and VMT					
	BMP-1: Alternative Fuels				
		25% Fleet Conversion	0.0		
		50% Fleet Conversion	0.1	_____	☐
		75% Fleet Conversion	0.1		
		100% Fleet Conversion	0.2		
	BMP-2: Engine Electrification				
		25% Fleet Conversion	15.2		
		50% Fleet Conversion	30.4	_____	☐
		75% Fleet Conversion	45.6		
		100% Fleet Conversion	60.8		
	BMP-3: Equipment and Vehicle Idling				
		< 3 minutes	1	_____	☐
	BMP-4: Heavy-Duty VMT Reduction Plan				
		15% Reduction in VMT	1.5	_____	☐
	BMP-5: Employee Commutes				
		50% Reduction in VMT	2.5	_____	☐
Total Project Score for Fuel and VMT (sum of BMP-1 to BMP-5)					n/a
Energy					
	BMP-10: Construction-Site Renewable Energy				
		25% of Energy Needs	0.3	_____	☐
	BMP-11: Paving Material Manufacturing				
		25% of Paving Materials	1.3		
		50% of Paving Materials	2.5	_____	☐
		75% of Paving Materials	3.8		
		100% of Paving Materials	5.0		
	BMP-12: Concrete Manufacturing				
		25% of Concrete Materials	1.3		
		50% of Concrete Materials	2.5	_____	☐
		75% of Concrete Materials	3.8		
		100% of Concrete Materials	5.0		
Total Project Score for Energy (sum of BMP-10 to BMP-12)					n/a
Total Project Construction Score (sum of Fuel and VMT and Energy)					n/a
Supporting BMPs					
Fuel and VMT					
	BMP-6: Equipment Fuel Efficiency				
		Engines >10 years	Low		☐

BMP-7: Construction Equipment		
Tier 2/3; GPS; tags	Low	☐
BMP-8: Engine Maintenance		
Require good practices	Low	☐
BMP-9: Heavy-Duty Vehicle Plan		
Prepare and implement	Low	☐
Energy		
BMP-13: Local Building Materials		
Give preference to venders	Low	☐
Waste		
BMP-14: Construction and Demolition Plan		
50% Waste Diversion	Low	☐
BMP-15: Composting		
75% waste composted	Low	☐
BMP-16: Waste Hauling		
50% waste to nearest facility	Low	☐
Miscellaneous		
BMP-17: Construction-Area Signage		
Post signs at construction site	-[b]	☐
BMP-18: Construction Personnel Training		
Train workers in good practices	Low	☐

[a] For BMPs selected, please provide a rational as to the technical, logistical, environmental, or economic infeasibility of the measure in Attachment C. If the measure is not applicable to project construction, not this in the attachment.
[b] GHG reduction unknown.

6.2.2 Operational BMP Scorecard

Sector	BMP	Implementation Requirement	Reduction Score (% Reduction)	Project Score
Transportation				
	BMP-19: Bicycle Parking*:			
		1 Bicycle Rack per 20 Spaces/Personnel	0.6	_____
	BMP-20: End-Use Facilities*			
		4 Showers and 1 Locker per 80 Spaces	0.6	_____
	BMP-21: Bicycle Lanes*			
		Provide Class I & II Access Points	0.6	_____
	BMP-22: Pedestrian Network*			
		Interconnect Pedestrian Facilities and Roads	0.8	_____
	BMP-23: Remove Pedestrian Barriers*:			
		Remove Pedestrian Barriers	1.0	_____
	BMP-24: Public Transit Shelters*:			
		Provide Bus Shelters and Information	0.4	_____
	BMP-25: High-Density Non-Residential Development*			
		FAR is ≥ 0.75 and < 1.5	0.5	
		FAR is ≥ 1.5 and < 2.25	0.6	_____
		FAR is ≥ 2.25	0.9	
	BMP-26: High-Density Residential Development*			
		Density is ≥ 7 and < 10 du/ac	1.9	
		Density is ≥ 11 and < 20 du/ac	3.9	

Sector	BMP	Implementation Requirement	Reduction Score (% Reduction)	Project Score
		Density is ≥ 21 and < 30 du/ac	5.9	_____
		Density is ≥ 31 and < 40 du/ac	6.9	
		Density is ≥ 41 and < 50 du/ac	8.9	
		Density is ≥ 50 du/ac	10.9	
	BMP-27: Urban Mixed-Use Design*			
		Jobs:houses Ratio is ≥ 0.5 and < 1.0	3.0	
		Jobs:houses Ratio is ≥ 1.0 and < 1.5	6.6	
		Jobs:houses Ratio is ≥ 1.5 and < 2.0	9.0	_____
		Jobs:houses Ratio is ≥ 2.0 and < 2.5	7.3	
		Jobs:houses Ratio is ≥ 2.5 and < 3.0	6.0	
		Jobs:houses Ratio is ≥ 3.0	4.6	
	BMP-28: Suburban Mixed-Use Design*			
		Provide 3 Mixed Uses within ¼ mile	3.0	_____
	BMP-29: Other Mixed-Use Design*			
		Dwellings are within 0.25 mile of Mixed Uses	1.0	_____
	BMP-30: Orientation Toward Alternative Transportation*			
		Minimize Setback Distance	0.4	_____
	BMP-31: Street Grid Development*			
		Provide Multiple and Direct Routing	1.0	_____
	BMP-32: Affordable Housing*			
		15% of Units are Deed Restricted	0.6	
		20% of Units are Deed Restricted	0.8	
		30% of Units are Deed Restricted	1.2	
		40% of Units are Deed Restricted	1.6	_____
		50% of Units are Deed Restricted	2.0	
		60% of Units are Deed Restricted	2.4	
		70% of Units are Deed Restricted	2.8	
		80% of Units are Deed Restricted	3.2	
		90% of Units are Deed Restricted	3.6	
		100% of Units are Deed Restricted	4.0	
	BMP-33: Traffic Calming*			
		Traffic Calming at 25% of Intersections	0.6	_____
	BMP-34: Neighborhood Electric Vehicles*			
		Provide for Infrastructure Development	1.0	_____
	BMP-35: Parking Fees*			
		Institute at Facilities within 0.25mile of Transit	2.8	_____
	BMP-36: Parking Limits*			
		Provide for the Minimum Code Requirement	4.5	_____
	BMP-37: Parking Lot Design*			
		Accommodate Pedestrian Facilities	0.5	_____
	BMP-38: Off Street Parking*			
		Prohibit Off-Street Parking	0.8	_____
		Total Project Score for Transportation (sum of BMP-19 to BMP-38)		
Energy				
	BMP-39: Exceed Title 24*			
		Exceed by 15–20%	1.0	_____
	BMP-40: Solar Orientation*			

Sector	BMP	Implementation Requirement	Reduction Score (% Reduction)	Project Score
		Implement CALGreen Voluntary Measures	0.5	_____
	BMP-41: Non-Roof Surfaces*:			
		Require on 30% of Non-Roof Surfaces	1.0	_____
	BMP-42: Green Roofs*			
		Require on 50% of Roof Area	0.5	_____
	BMP-43: Energy Star Roof*			
		Utilize Energy Star Materials	0.5	_____
	BMP-44: Energy Star Appliances			
		Energy Star Builder Supplied Appliances	0.2	_____
	BMP-45: Lighting Standards			
		50% of Outdoor Light Fixtures	0.2	_____
	BMP-46: Solar Water Heaters			
		25-50% of hot water	0.3	_____
	BMP-47: On-Site Renewable Energy*			
		12.5% of Energy Costs	1.0	_____
		Total Project Score for Energy (sum of BMP-39 to BMP-47)		
Water				
	BMP-49: CALGreen Voluntary Measures			
		Implement CALGreen Voluntary Measures	0.1	_____
	BMP-50: Low-Flow Fixtures			
		Require for all New Development	0.2	_____
	BMP-51: Water-Efficient Landscapes			
		Design Water Efficient Landscapes	0.1	_____
	BMP-52: Smart Irrigation Control Systems			
		Install Systems	0.1	_____
	BMP-53: Gray Water			
		Require for Outdoor Uses	0.2	_____
		Total Project Score for Water (sum of BMP-49 to BMP-53)		
Waste				
	BMP-56: Institute Recycling Services			
		75% waste recycled	0.7	_____
	BMP-57: Institute Composting Services			
		75% waste composted	0.7	_____
		Total Project Score for Waste (sum of BMP-56 and BMP-57)		
Total Project Operational Score (sum of Transportation, Energy, Water, and Waste)[a]				
Supporting BMPs				
Energy				
	BMP-48: Roofing Materials			
		Exceed Title 24 requirements	Moderate	☐
Water				
	BMP-54: Native Landscaping			
		Native or drought resistant plants	Low	☐
	BMP-55: Low Impact Development			
		Implement LID practices	Moderate	☐
Waste				
	BMP-58: Institute Waste Reduction Services			

Sector	BMP	Implementation Requirement	Reduction Score (% Reduction)	Project Score
		Purchase fewer products	Moderate	☐
	BMP-59: Public Education for Waste Management			
		Provide waste-related education	Low	☐
	BMP-60: Environmentally Preferable Purchasing			
		30% recycled paper	Low	☐
Land Cover				
	BMP-61: Urban Tree Planting			
		Plant trees along streets and near buildings	Low - Moderate[b]	☐
	BMP-62: Land Conservation and Preservation			
		Conserve or create new land uses	Low - Moderate[b]	☐
	BMP-63: Create New Vegetative Space			
		Create new grassland	Low-Moderate[b]	☐

[a] If the total project operational score is 29 or greater, the project is considered to have a less-than-significance impact on climate change. If the total project operational score is less than 29, the project is considered to have a potentially significant impact and further analysis should be undertaken (i.e. quantification using project-specific inputs).
[b] GHG benefits based on the number of trees/acres created. The more trees/acres created, the higher the GHG reductions.

6.2.3 BMP Reduction Potential Summary Figures

This section provides a graphical representation of the potential GHG reductions achieved by each quantifiable BMP. Figure F-3 depicts construction-related measures and Figure F-4 depicts operational-related measures. When measures achieve a range of reductions, the average reduction potential is graphed, with the minimum and maximum reductions shown as error bars.

Note that Figures F-3 and F-4 summarize only potential GHG reductions; they do not account for co-benefits or the cost effectiveness of individual measures. As a result, measures with limited GHG reductions might appear less important or appealing than measures with higher GHG reductions. However, as discussed, specific measures might achieve significant co-benefits, such as reductions in criteria air pollutants, cost savings, and increased sequestration. Project applicants are therefore encouraged to chose the most appropriate GHG reduction measures, taking into consideration the suite of information presented above, as well as cost, schedule, and other project requirements.

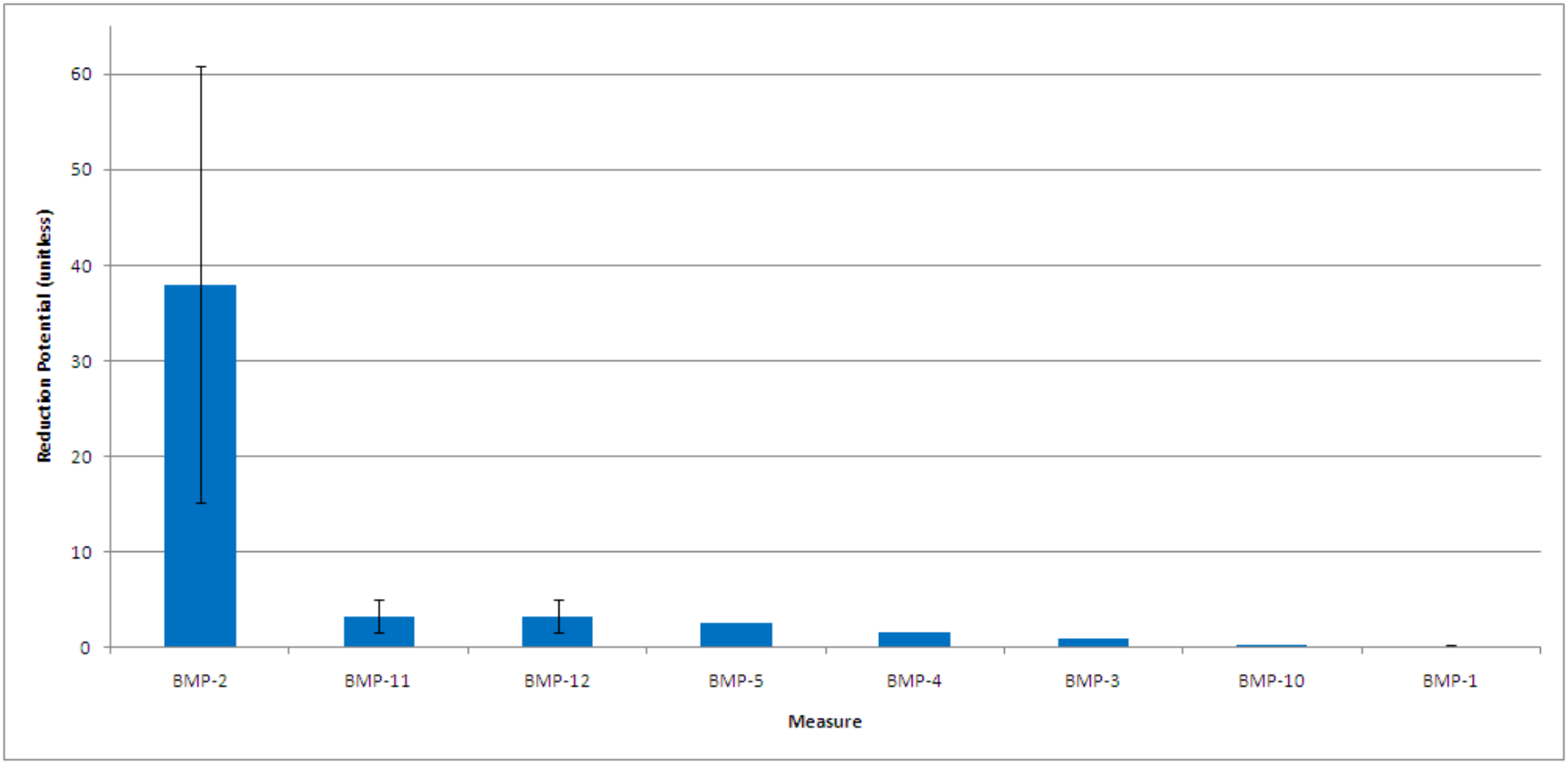


Figure F-3. Construction BMP Reduction Potential Summary

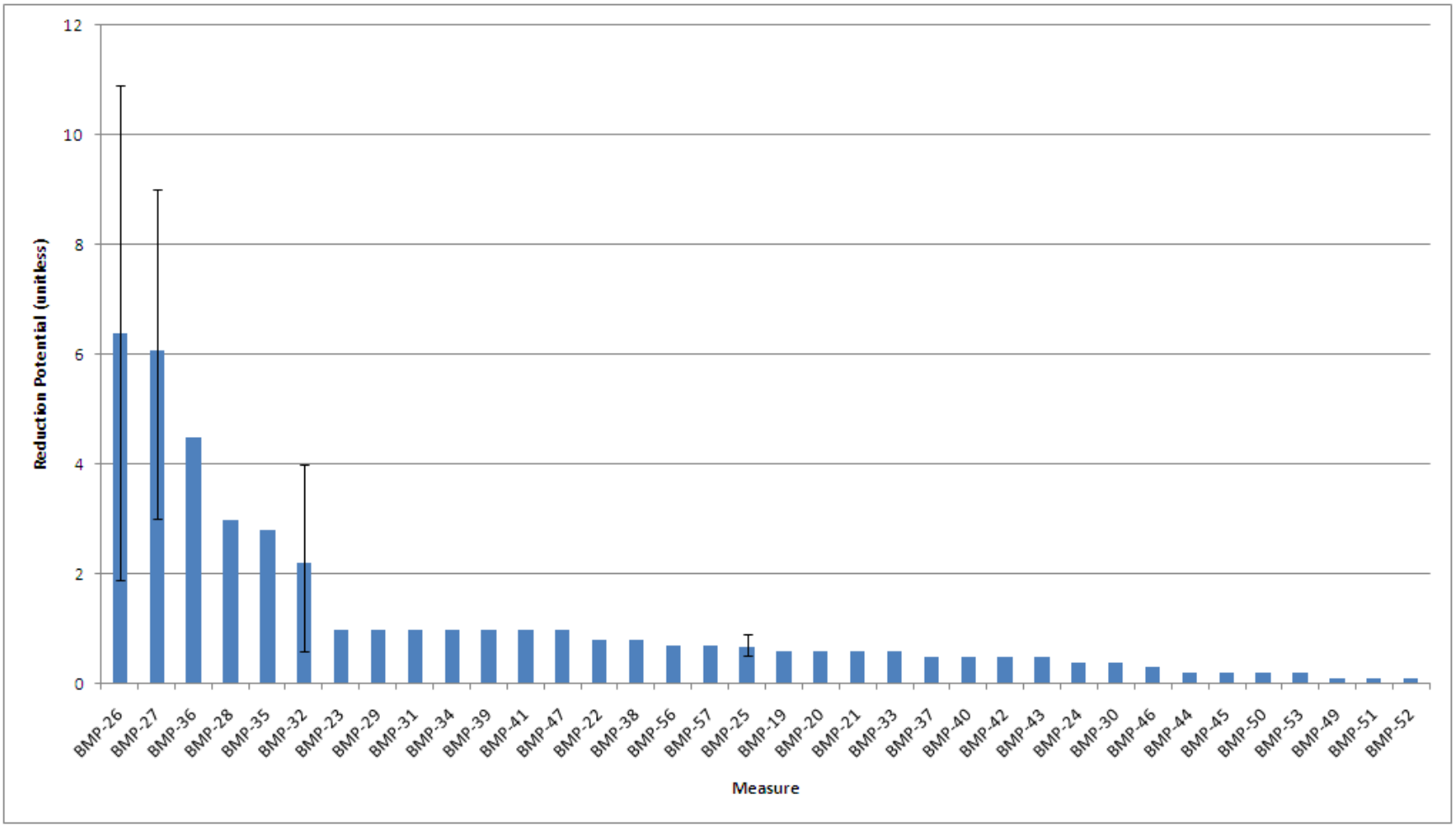


Figure F-4. Operational BMP Reduction Potential Summary

References

California Air Pollution Control Officers Association. 2010. Quantifying Greenhouse Gases Mitigation Measures. August. Available: <http://www.valleyair.org/Programs/CCAP/bps/CAPCOA-Quantification-Report-Final.pdf>. Accessed: November 22, 2010.

California Air Resources Board. 2009. Staff Report: Initial Statement of Reasons for the Proposed Regulation to Reduce Methane Emissions from Municipal Solid Waste Landfills. Available: <http://www.arb.ca.gov/regact/2009/landfills09/appf.pdf>.

California Air Resources Board. 2010. Proposed Method For Estimating Greenhouse Gas Emission Reductions From Compost From Commercial Organic Waste. August. Available: <http://www.calrecycle.ca.gov/Actions/PublicNoticeDetail.aspx?id=248&aiid=248>. Accessed: December 22, 2010.

California Integrated Waste Management Board. 2009. *Construction and Demolition (C&D) Waste Diversion in California.* Available at: http://www.calrecycle.ca.gov/ConDemo/Pubs.htm Accessed December 29, 2009.

CalRecycle. 2010. California Waste Stream Profiles: Home Page. Last Revised: January 2010. Available: < http://www.calrecycle.ca.gov/profiles/>. Accessed: March 18, 2011.

California Office of the Attorney General.2010. Addressing Climate Change at the Project Level. Available at http://ag.ca.gov/globalwarming/pdf/GW_mitigation_measures.pdf. Last updated January 6, 2010. Accessed August 16, 2010.

Concrete Network. 2010. Concrete Network. Available: <http://www.concretenetwork.com/>. Accessed: November 22, 2010.

Institute of Transportation Studies – University of California Davis. 2007. *A Low Carbon Fuel Standard for California Part 1: Technical Analysis*. Project Leads: Alexander Farrell and Daniel Sperling. Available at http://pubs.its.ucdavis.edu/publication_detail.php?id=1082. Accessed December 29, 2009.

Office of Planning and Research. Technical Advisory: CEQA and Low Impact Development Stormwater Design: Preserving Stormwater Quality and Stream Integrity through the California Environmental Quality Act (CEQA). August 5, 2009. Available: <http://www.opr.ca.gov/ceqa/pdfs/Technical_Advisory_LID.pdf>. Accessed: December 28, 2010.

San Joaquin Valley Air Pollution Control District. 2009. Final Staff Report: Addressing Greenhouse Gas Emissions Impacts under the California Environmental Quality Act. December 17.

San Joaquin Valley Air Pollution Control District. 2010. GHG Emissions Reduction Measures for Development Projects. Available; <http://www.valleyair.org/Programs/CCAP/ghg/ghg_idx.htm>. Accessed: December 17, 2010.

San Joaquin Council of Governments. 2010. 2011 Regional Transportation Plan. Table 3-1. Available: <http://www.sjcog.org/docs/pdf/Transportation/RTP/2011/2011_RTP_WithAppendices.pdf>. Accessed: November 22, 2010.

Green Highway Partnership. 2010. Recycle and Beneficial Reuse Group. http://www.greenhighwayspartnership.org/index.php?option=com_content&view=article&id=23&Itemid=22. Accessed: November 22, 2010.

U.S. Environmental Protection Agency. 2008. EPA-Recommended Environmental Best Practices for Federally-Funded Projects. Available: <http://www.swrcb.ca.gov/water_issues/programs/grants_loans/srf/docs/economic_recovery/epa_recom_environ_best_practices.pdf>. Accessed: November 22, 2010.

U.S. Environmental Protection Agency. 2009. *Potential for Reducing Greenhouse Gas Emissions in the Construction Sector.* Available:<http://www.epa.gov/sustainableindustry/pdf/construction-sector-report.pdf>. http://www.epa.gov/waste/nonhaz/municipal/pubs/msw2008rpt.pdf Accessed December 22, 2010.

U.S. Environmental Protection Agency. 2011. Energy Projects and Candidate Landfills. Available: <http://www.epa.gov/lmop/projects-candidates/index.html#map-area>.

Warm Mix Asphalt Group. 2010. Warm Mix Asphalt. Available: <http://www.warmmixasphalt.org/>. Accessed: November 22, 2010.

Attachment A: Landfill Information

This attachment contains a list of landfills that have historically served the Stockton area (Table A-1). The prevalence of a methane capture system, as well as the current methane capture rate is also noted. The values provided below were obtained from CalRecycle (2010), the EPA's Landfill Methane Outreach Program database (2011), and Appendix F of CARB's (2009) *Staff Report: Initial Statement of Reasons for the Proposed Regulation to Reduce Methane Emissions from Municipal Solid Waste Landfills*. If your project will send waste to a landfill not listed below, please consult these sources to determine if the landfill in question has a methane capture system.

Table A-1. Landfills serving the Stockton Area

Site	Capture System?	Capture Rate[a]
Altamont Landfill & Resource Recv`ry	Yes	17%
American Avenue Disposal Site	Yes	75%
Anderson Landfill, Inc.	Yes	75%
Arvin Sanitary Landfill	Yes	75%
Austin Road /Forward Landfill	Yes	75%
Azusa Land Reclamation Co. Landfill	Yes	89%
Bakersfield Metropolitan (Bena) SLF	Yes	75%
Billy Wright Disposal Site	No	0%
Corral Hollow Landfill	Yes	75%
Covanta Stanislaus, Inc.	No	0%
CWMI, KHF (MSW Landfill B-19)	No	0%
Fink Road Landfill	Yes	75%
Foothill Sanitary Landfill	No	0%
Forward Landfill, Inc.	Yes	75%
French Camp Landfill	No	0%
Guadalupe Sanitary Landfill	Yes	39%
Highway 59 Disposal Site	No	0%
Keller Canyon Landfill	Yes	75%
Kettleman Hills - B18 Nonhaz Codisposal	Yes	75%
L and D Landfill Co	No	0%
North County Landfill	No	0%
Potrero Hills Landfill	Yes	75%
Puente Hills Landfill	Yes	48%
Recology (Norcal) Ostrom Road LF Inc.	No	0%
Recology Hay Road	No	0%
Recology Pacheco Pass	Yes	75%
Sacramento County Landfill (Kiefer)	Yes	21%
Southeast Resource Recovery Facility	No	0%
Unknown Destination	No	0%
Vasco Road Sanitary Landfill	Yes	75%
West Contra Costa Landfill	Yes	75%
Yolo County Central Landfill	Yes	52%
Zanker Material Processing Facility	No	0%
Zanker Road Class III Landfill	Yes	75%

[a] If the methane capture rate was unknown, a default rate of 75% was assumed.

Attachment F-B: SJVAPCD Interim GHG Emissions Reductions Calculator (Web Link)

The SJVAPCD has an Interim GHG Emissions Reduction Calculator (Reduction Calculator) that contains estimated carbon dioxide reduction potentials for a series of best performance standards, including several measures summarized in Section 5. The majority of the GHG reduction estimates presented in the Reduction Calculator and the Scorecard will be identical. However, for some BMPs, the Reduction Calculator might offer a slightly more detailed breakdown of potential implementation strategies and corresponding GHG reductions (e.g., three options for NEV development). In addition, the Reduction Calculator provides additional information of the reduction methodology and source. Project applicants are therefore encouraged to use the Reduction Calculator as a supplement to the BMP Scorecard presented in Section 6.

The reduction calculator is available (as of May 2013) on the SJVAPCD web site at: http://www.valleyair.org/programs/CCAP/ghg/ghg_idx.htm.

Attachment C: Supporting Documentation for the Infeasibility of a Construction BMP

BMPs identified in the Construction Scorecard must be considered by all projects even though the SJVAPCD has not established a significance threshold. However, it is likely some measures might not reasonable or feasible for particular projects. The information presented in Sections 3 and 5 is intended to assist project applicants in making this determination. If after consideration, a measure is deemed infeasible, a rational must provided below. More specifically, project applicants must document 1) which measures have been determined to be infeasible; 2) rational as to why the measure was determined to be infeasible; and 3) documents and references consulted in making the feasibility determination.

Acceptable rationales include the following:

- **Technical**: For example, it might be technically impossible to provide electric service to the project area to support fleet electrification.
- **Logistical:** For example, supplying electrical service to the project site might require use of adjacent lands, which are beyond the jurisdiction of the project applicant.
- **Environmental:** For example, supplying electrical service to the project site might require use of adjacent wetland and therefore result in a significant impact to biological resources.
- **Economic:** For example, utilizing alternative fuels might be cost prohibitive. Please note that if a measure is deemed cost prohibitive, sufficient justification as to the increase in cost must be provided.
- **Applicability:** For example, BMP-11, which requires at least 25% of paving materials to be low energy intensive, could not apply to projects that do not involve paving.

This form should only be completed if you have identified a measure as infeasible in the Construction Scorecard. Please answer the questions with the most precise and complete information known. Failure to complete all questions or provide sufficient supporting documentation might cause delays in project approval.

Fuels and VMT

1. Please list the BMPs that were identified as infeasible in Fuels and VMT section (BMP-1 through BMP- 5) of the Construction Scorecard. If all BMPs will be implemented, please write "N/A" in the response box and proceed to the next section.

2. Please describe why each BMP listed in Question 1 was determined to be infeasible. Provide sufficient information to accurately document the hardship that would be incurred. Please refer to the introduction to this attachment for examples of acceptable rationales.

3. Please list all references consulted in making the infeasibility determination.

Energy

1. Please list the BMPs that were identified as infeasible in Energy section (BMP-10 and BMP-11) of the Construction Scorecard. If all BMPs will be implemented, please write "N/A" in the response box and proceed to the next section.

2. Please describe why each BMP listed in Question 1 was determined to be infeasible. Provide sufficient information to accurately document the hardship that would be incurred. Please refer to the introduction to this attachment for examples of acceptable rationales.

3. Please list all references consulted in making the infeasibility determination.

Attachment D: Example BMP Scorecards and Supporting BMP Ranking Table

This attachment provides examples of completed BMP Scorecards and the Supporting BMP Ranking Table. Please note that this attachment is intended to assist project applicants in completing Section 6 and is provided for informational purposes only.

D.1 Example Completed Construction BMP Scorecard

Sector	BMP	Implementation Requirement	Reduction Score (% Reduction)	Project Score	BMP Infeasible[a]
Fuel and VMT					
	BMP-1: Alternative Fuels				
		25% Fleet Conversion	0.0		
		50% Fleet Conversion	0.1	0.1	☐
		75% Fleet Conversion	0.1		
		100% Fleet Conversion	0.2		
	BMP-2: Engine Electrification				
		25% Fleet Conversion	15.2		
		50% Fleet Conversion	30.4	30.4	☐
		75% Fleet Conversion	45.6		
		100% Fleet Conversion	60.8		
	BMP-3: Equipment and Vehicle Idling				
		< 3 minutes	1	1	☐
	BMP-4: Heavy-Duty VMT Reduction Plan				
		15% Reduction in VMT	1.5	1.5	☐
	BMP-5: Employee Commutes				
		50% Reduction in VMT	2.5	2.5	☐
Total Project Score for Fuel and VMT (sum of BMP-1 to BMP-5)				35.5	n/a

Sector	BMP	Implementation Requirement	Reduction Score (% Reduction)	Project Score	BMP Infeasible[a]
Energy					
	BMP-10: Construction-Site Renewable Energy				
		25% of Energy Needs	0.3	0.3	☐
	BMP-11: Paving Material Manufacturing				
		25% of Paving Materials	1.3		
		50% of Paving Materials	2.5		☒
		75% of Paving Materials	3.8		
		100% of Paving Materials	5.0		
	BMP-12: Concrete Manufacturing				
		25% of Concrete Materials	1.3		
		50% of Concrete Materials	2.5		☒
		75% of Concrete Materials	3.8		
		100% of Concrete Materials	5.0		
	Total Project Score for Energy (sum of BMP-10 to BMP-12)			0.3	n/a
	Total Project Construction Score (sum of Fuel and VMT and Energy)			**35.8**	n/a

Supporting BMPs

Fuel and VMT					
	BMP-6: Equipment Fuel Efficiency				
		Engines >10 years	Low	☒ ☐	
	BMP-7: Construction Equipment				
		Tier 2/3; GPS; tags	Low	☒ ☐	
	BMP-8: Engine Maintenance				
		Require good practices	Low	☒ ☐	
	BMP-9: Heavy-Duty Vehicle Plan				
		Prepare and implement	Low	☒ ☐	
Energy					
	BMP-13: Local Building Materials				
		Give preference to venders	Low	☒ ☐	
Waste					
	BMP-14: Construction and Demolition Plan				
		50% Waste Diversion	Low	☐ ☒	
	BMP-15: Composting				
		75% waste composted	Low	☒ ☐	
	BMP-16: Waste Hauling				
		50% waste to nearest facility	Low	☒ ☐	
Miscellaneous					
	BMP-17: Construction Area Signage				
		Post signs at construction site	-[b]	☒ ☐	
	BMP-18: Construction Personnel Training				
		Train workers in good practices	Low	☒ ☐	

[a] For BMPs selected, please provide a rational as to the technical, logistical, environmental, or economic infeasibility of the measure in Attachment C. If the measure is not applicable to project construction, not this in the attachment.

[b] GHG reduction unknown.

D.2 Example Completed Operational BMP Scorecard

Sector	BMP	Implementation Requirement	Reduction Score (% Reduction)	Project Score
Transportation				
	BMP-19: Bicycle Parking*:			
		1 Bicycle Rack per 20 Spaces/Personnel	0.6	0.6
	BMP-20: End-Use Facilities*			
		4 Showers and 1 Locker per 80 Spaces	0.6	0.6
	BMP-21: Bicycle Lanes*			
		Provide Class I & II Access Points	0.6	0.6
	BMP-22: Pedestrian Network*			
		Interconnect Pedestrian Facilities and Roads	0.8	0.8
	BMP-23: Remove Pedestrian Barriers*:			
		Remove Pedestrian Barriers	1.0	1.0
	BMP-24: Public Transit Shelters*:			
		Provide Bus Shelters and Information	0.4	
	BMP-25: High-Density Non-Residential Development*			
		FAR is ≥ 0.75 and < 1.5	0.5	
		FAR is ≥ 1.5 and < 2.25	0.6	
		FAR is ≥ 2.25	0.9	
	BMP-26: High Density Residential Development*			
		Density is ≥ 7 and < 10 du/ac	1.9	
		Density is ≥ 11 and < 20 du/ac	3.9	
		Density is ≥ 21 and < 30 du/ac	5.9	
		Density is ≥ 31 and < 40 du/ac	6.9	
		Density is ≥ 41 and < 50 du/ac	8.9	
		Density is ≥ 50 du/ac	10.9	
	BMP-27: Urban Mixed-Use Design*			
		Jobs:houses Ratio is ≥ 0.5 and < 1.0	3.0	
		Jobs:houses Ratio is ≥ 1.0 and < 1.5	6.6	
		Jobs:houses Ratio is ≥ 1.5 and < 2.0	9.0	9.0
		Jobs:houses Ratio is ≥ 2.0 and < 2.5	7.3	
		Jobs:houses Ratio is ≥ 2.5 and < 3.0	6.0	
		Jobs:houses Ratio is ≥ 3.0	4.6	
	BMP-28: Suburban Mixed-Use Design*			
		Provide 3 Mixed Uses within ¼ mile	3.0	
	BMP-29: Other Mixed-Use Design*			
		Dwellings are within 0.25 mile of Mixed Uses	1.0	
	BMP-30: Orientation Toward Alternative Transportation*			
		Minimize Setback Distance	0.4	
	BMP-31: Street Grid Development*			
		Provide Multiple and Direct Routing	1.0	1.0
	BMP-32: Affordable Housing*			
		15% of Units are Deed Restricted	0.6	
		20% of Units are Deed Restricted	0.8	
		30% of Units are Deed Restricted	1.2	

Sector	BMP	Implementation Requirement	Reduction Score (% Reduction)	Project Score
		40% of Units are Deed Restricted	1.6	3.6
		50% of Units are Deed Restricted	2.0	
		60% of Units are Deed Restricted	2.4	
		70% of Units are Deed Restricted	2.8	
		80% of Units are Deed Restricted	3.2	
		90% of Units are Deed Restricted	3.6	
		100% of Units are Deed Restricted	4.0	
	BMP-33: Traffic Calming*			
		Traffic Calming at 25% of Intersections	0.6	0.6
	BMP-34: Neighborhood Electric Vehicles*			
		Provide for Infrastructure Development	1.0	1.0
	BMP-35: Parking Fees*			
		Institute at Facilities within 0.25 mile of Transit	2.8	
	BMP-36: Parking Limits*			
		Provide for the Minimum Code Requirement	4.5	4.5
	BMP-37: Parking Lot Design*			
		Accommodate Pedestrian Facilities	0.5	
	BMP-38: Off-Street Parking*			
		Prohibit Off-Street Parking	0.8	
		Total Project Score for Transportation (sum of BMP-19 to BMP-38)		23.3
Energy				
	BMP-39: Exceed Title 24*			
		Exceed by 15%	1.0	1.0
	BMP-40: Solar Orientation*			
		Implement CALGreen Voluntary Measures	0.5	0.5
	BMP-41: Non-Roof Surfaces*:			
		Require on 30% of Non-Roof Surfaces	1.0	1.0
	BMP-42: Green Roofs*			
		Require on 50% of Roof Area	0.5	
	BMP-43: Energy Star Roof*			
		Utilize Energy Star Materials	0.5	
	BMP-44: Energy Star Appliances			
		Energy Star Builder-Supplied Appliances	0.2	0.2
	BMP-45: Lighting Standards			
		50% of Outdoor Light Fixtures	0.2	0.2
	BMP-46: Solar Water Heaters			
		25-50% of Water Heating	0.3	
	BMP-47: On-site Renewable Energy*			
		12.5% of Energy Costs	1.0	1.0
		Total Project Score for Energy (sum of BMP-39 to BMP-47)		3.9
Water				
	BMP-49: CALGreen Voluntary Measures			
		Implement CALGreen Voluntary Measures	0.1	0.1
	BMP-50: Low-Flow Fixtures			
		Require for all New Development	0.2	0.2
	BMP-51: Water-Efficient Landscapes			

Sector	BMP	Implementation Requirement	Reduction Score (% Reduction)	Project Score
		Design Water Efficient Landscapes	0.1	_____
	BMP-52: Smart Irrigation Control Systems			
		Install Systems	0.1	___0.1____
	BMP-53: Gray Water			
		Require for Outdoor Uses	0.2	_____
		Total Project Score for Water (sum of BMP-49 to BMP-53)		0.4
Waste				
	BMP-56: Institute Recycling Services			
		75% waste recycled	0.7	__0.7____
	BMP-57: Institute Composting Services			
		75% waste composted	0.7	___0.7____
		Total Project Score for Waste (sum of BMP-56 and BMP-57)		1.4
Total Project Operational Score (sum of Transportation, Energy, Water, and Waste)[a]				**29**

Supporting BMPs

Energy			
	BMP-48: Roofing Materials		
	Exceed Title 24 requirements	Moderate	☐
Water			
	BMP-54: Native Landscaping		
	Native or drought-resistant plants	Low	☒
	BMP-55: Low Impact Development		
	Implement LID practices	Moderate	☐
Waste			
	BMP-58: Institute Waste Reduction Services		
	Purchase fewer products	Moderate	☒
	BMP-59: Public Education for Waste Management		
	Provide waste-related education	Low	☐
	BMP-60: Environmentally Preferable Purchasing		
	30% recycled paper	Low	☐
Land Cover			
	BMP-61: Urban Tree Planting		
	Plant trees along streets and near buildings	Low - Moderate[b]	☒
	BMP-62: Land Conservation and Preservation		
	Conserve or create new land uses	Low - Moderate[b]	☒
	BMP-63: Create New Vegetative Space		
	Create new grassland	Low-Moderate[b]	☐

[a] If the total project operational score is 29 or greater, the project is considered to have a less-than-significant impact on climate change. If the total project operational score is less than 29, the project is considered to have a potentially significant impact and further analysis should be undertaken (i.e. quantification using project-specific inputs).

[b] GHG benefits based on the number of trees/acres created. The more trees/acres created, the higher the GHG reductions.

Appendix G
References

Appendix G
References

California Air Resources Board 2007. *California Greenhouse Gas Inventory - Summary by Economic Section.* Last Updated November 19, 2007. Available: http://www.arb.ca.gov/cc/inventory/archive/tables/ghg_inventory_sector_90-04_sum_2007-11-19.pdf. Last accessed May 4, 2013.

California Air Resources Board. 2008. *Climate Change Scoping Plan*. December. Available: <http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm>. Accessed: May 18, 2011.

California Air Resources Board. 2010a. *Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories*. Version 1.1. May.

California Air Resources Board. 2010b. Graphs & Plots. Available: <http://www.arb.ca.gov/cc/inventory/data/graph/graph.htm?>. Accessed: May 18, 2011.

California Air Resources Board. 2010c. *California Greenhouse Gas Inventory for 2000–2008-by Emissions Category as Defined in the Scoping Plan*. Last Revised: May 12, 2010. Available: < http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_00-08_2010-05-12.pdf>. Accessed: June 13, 2011.

California Air Resources Board. 2013. *California Greenhouse Gas Inventory for 2000–2011-by Category as Defined in the Scoping Plan*. Last Revised: August 1, 2013. Available: < http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_00-11_2013-08-01.pdf. Last accessed: September 28, 2013.

California Climate Action Registry. 2009. *General Reporting Protocol*. Version 3.1. Available: <http://www.climateregistry.org/resources/docs/protocols/grp/GRP_3.1_January2009.pdf>. Accessed: August 23, 2010.

California Energy Commission. 2006a. *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004*. CEC-600-2006-013-SF. December.

California Energy Commission. 2006b. *California Commercial End-Use Survey*. Available: <http://www.energy.ca.gov/ceus>.

California Energy Commission. 2009. *Climate Change Scenarios and Sea Level Rise Estimates for California 2008 Climate Change Scenario Assessment*. Available: <http://www.energy.ca.gov/2009publications/CEC-500-2009-014/CEC-500-2009-014-D.PDF>. Accessed: January 27, 2011.

California Natural Resources Agency. 2009. *2009 California Climate Adaptation Strategy*. Available: <http://www.energy.ca.gov/2009publications/CNRA-1000-2009-027/CNRA-1000-2009-027-F.PDF>. Accessed: January 27, 2011.

City of Stockton. 2010. *2005 Community Emissions Inventory & 2005 Municipal Operations Emissions Inventory*. Prepared by Kindelberg Morales. July.

City of Stockton. 2011a. *Draft 2010 City of Stockton Urban Wastewater Management Plan*. K/J Project No. 1170004*00. May.

City of Stockton. 2011b. *Draft Capital Improvement and Energy Management Plan*. Prepared by Carollo Engineers. May.

City of Tracy. 2011. City of Tracy Sustainability Action Plan. February.

ConSol. 2010. *Water Use in the California Residential Home*. January.

Energy Information Administration. 2008. *2003 CBECS Detailed Tables. Released September 2008*. Available: <http://www.eia.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/detailed_tables_2003.htm>. Accessed: March 15, 2011.

Fehr & Peers. 2011. *City of Stockton Climate Action Plan (CAP) Implementation, Effect on Vehicle Travel*. Memorandum to Laura Yoon, ICF International. June 16.

Freedonia Group. 2011. *Power Lawn and Garden Equipment: US Industry Study with Forecasts for 2015 & 2020*. April.

ICF. 2010. Updates to the City of Livermore's 2005 GHG Inventory and Forecast. Prepared for the City of Livermore. Unpublished.

ICF Jones & Stokes. 2009. Greenhouse Gas Emissions Inventory for Sacramento County (Unincorporated Sacramento County and Cities of Citrus Heights, Elk Grove, Folsom, Galt, Isleton, Rancho Cordova, and Sacramento). Prepared for Sacramento County Department of Environmental Review and Assessment. June.

ICLEI. 2012. U.S. Community Protocol for Accounting and Reporting Greenhouse Gas Emissions. October.

Intergovernmental Panel on Climate Change (IPCC). 1996. *Climate Change 2005: The Science of Climate Change*. Cambridge University Press. Cambridge, U.K.

Intergovernmental Panel on Climate Change (IPCC). 2001. *Atmospheric Chemistry and Greenhouse Gases*. In: Climate Change 2001: Working Group I: The Scientific Basis.

Intergovernmental Panel on Climate Change (IPCC). 2006. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html>. Accessed: December 29, 2008.

Intergovernmental Panel on Climate Change (IPCC). 2007a. *Climate Change 2007: Synthesis Report, Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Pachauri, R. K. and Reisinger, A.(eds.)], IPCC, Geneva, Switzerland.

Intergovernmental Panel on Climate Change (IPCC). 2007b. *Changes in Atmospheric Constituents and in Radiative Forcing*. In: Climate Change 2007: The Physical Science Basis (Working Group 1 Fourth Assessment Report). February.

Lee, J. and J. Six. 2010. *Effect of Climate Change on Field Crop Production and Greenhouse Gas Emissions in California's Central Valley*. Available: <http://www.iuss.org/19th%20WCSS/symposium/pdf/1387.pdf>. Accessed: May 27, 2011.

Morales, Kindelberg. Administrative Analyst II. City of Stockton, Stockton, CA. December 2010. Email message to Laura Yoon, ICF International.

National Oceanic and Atmospheric Administration. 2005. *Greenhouse Gases: Frequently Asked Questions*. Available: <http://lwf.ncdc.noaa.gov/oa/climate/gases.html>. Accessed: September 22, 2009.

San Joaquin County. 2009. General Plan Background Reports. Chapter 5: Climate Change

Taylor, Tanisha. San Joaquin Council of Governments, Stockton, CA. August 17, 2011-email message to Laura Yoon, ICF International.

U.S. Census. 2005. *2005 American Communities Survey*. Available: <http://factfinder.census.gov/servlet/ADPGeoSearchByListServlet?ds_name=ACS_2005_EST_G00_&_lang=en&_ts=322657528706>. Accessed: May 5, 2011.

U.S. Environmental Protection Agency, U.S. Department of Transportation, California Air Resources Board. 2010. Interim Joint Technical Assessment Report: Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2017-2025. September.

U.S. Environmental Protection Agency. 2006. *High Global Warming Potential (GWP) Gases.* Available:< http://www.epa.gov/highgwp/index.html>. Accessed: September 4, 2009.

U.S. Environmental Protection Agency. 2010a. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2008*. Available:<http://www.epa.gov/climatechange/emissions/usinventoryreport.html>. Accessed: May 18, 2011.

U.S. Environmental Protection Agency. 2010b. *2009 Annual Report*. Responsible Appliance Disposal Program.

U.S. Environmental Protection Agency. 2011. *Greenhouse Gas Equivalences Calculator*. Last Revised: May 2011. Available: <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>. Accessed: July 5, 2011.

U.S. Environmental Protection Agency (EPA). No date. *SmartWay Transport Partnership, Idle Reduction: A Glance at Clean Freight Strategies*. Available: http://www.epa.gov/otaq/smartway/transport/documents/tech/idle-reduction.pdf; http://www.epa.gov/otaq/smartway/transport/calculators/index.htm

United Nations Framework Convention on Climate Change (UNFCC). 2006. *Review of the Implementation of Commitments and of Other Provisions of the Convention*. March. Page 7. Available: <http://unfccc.int/resource/docs/cop8/08.pdf>. Accessed: September 22, 2009.

Wartgow, Gregg. 2011. *Market Watch—Electric Equipment*. Last Revised: April 26, 2011. Available: < http://www.greenindustrypros.com/article/10258115/market-watch-electric-equipment>. Accessed: July 5, 2011.

World Resources Institute. 2009. *World Greenhouse Gas Emissions: 2005*. Last Revised: July 2, 2009. Available: <http://www.wri.org/chart/world-greenhouse-gas-emissions-2005>. Accessed: June 13, 2011.

Appendix H
Competitiveness Analysis

MEMORANDUM

To: City of Stockton Climate Action Plan Committee

CC: David Stagnaro, City of Stockton
Rich Walter, ICF International

From: Walter Kieser and Ben Sigman

Subject: Revised Stockton CAP Competitiveness Analysis; EPS# 19604.2

Date: October 1, 2013

As a part of developing the Climate Action Plan (CAP) Work Program, the City of Stockton determined that consideration of potential competitiveness effects of the CAP was necessary as part of the effort. This memorandum summarizes the EPS Competitiveness Analysis of the City of Stockton CAP. The memorandum provides an introduction to the topic of competitiveness, an overview of existing economic conditions in Stockton, a summary of CAP measures, and our assessment of their potential competiveness effects. The City commissioned this analysis to address concerns that the CAP, insofar as it creates new mandates and costs on the private sector, would negatively affect the City's ability to compete in the regional marketplace (e.g., through higher costs of construction, higher cost of living, etc.). The City of Stockton released the Draft CAP to the public on February 6, 2012. Updated information on solar measure costs and savings was provided by ICF on March 8, 2013 and on City staffing on October 2, 2013. In summary, and following our careful review of the CAP measures, our analysis concludes that the measures detailed in the CAP have been designed to minimize cost burdens on businesses and residents and thus the net competitiveness impacts are likely to be very limited or insignificant.

Characterization of Competitiveness Effects

EPS has conducted a review of the Draft CAP document (includign the revised solar measure cost evaluation from ICF) and performed an evaluation of competitiveness issues.[1] Based on the evaluation we have organized the recommended measures into three categories reflecting their potential competiveness impacts on the City of Stockton:

1. **Private Sector Mandates.** Our evaluation has determined that potential negative competitiveness impacts primarily would arise from mandatory CAP measures that result in cost burdens for the private sector (businesses and households). Based on that rationale, EPS has identified only two CAP measures which create private costs quantified in the CAP (Waste-1 and Off-Road-2). Together, these mandatory measures total $8.15 million in

[1] **Figure 4**, provided at the end of this memorandum, offers a summary of CAP measures.

additional capital cost and $5.30 million in additional annual cost attributable to the CAP. In the Stockton Metropolitan Area's $19.4 billion economy, these costs are relatively insignificant.[2]

Waste-1, a CAP measure to increase waste diversion from landfills to recycling, will have direct cost implications for the waste services sector, though some portion of the additional cost will likely be passed on to waste service consumers broadly. Off-Road-2, a measure to reduce fuel usage by construction equipment, will have direct cost implications for the construction section, but these new costs also are likely to be transferred to consumers. Given the likelihood that costs will be borne by endpoint consumers, EPS does not anticipate that mandatory CAP measures will create a disproportionate cost burden for particular economic sectors. However, to the degree that the waste services sector and construction sector are unable to shift costs to consumers, these sectors would bear a cost burden beyond that experienced by other local industries.

2. **Private sector cost incidence of City Costs.** Some competitiveness issues may arise from the CAP measures categorized as "City Cost" insofar as these measures may be funded from additional revenue from the private sector. The Draft CAP identifies approximately $29.9 million in one-time City costs and an additional $270,000 in net annual costs (see **Figure 4**). While the high-cost transportation measures may be partially or substantially funded by state or federal grants (e.g., Trans-5/bike paths, Trans – 7a and 8a/safe routes to school) and other measures would generate recurring annual cost savings for the City (e.g., Energy-2a/outdoor lighting), some City costs may be passed on to City residents and businesses. The effect of the municipal cost burden on economic competitiveness largely will be determined by the magnitude and degree to which City costs are passed on to tax-paying residents and businesses, rather than funded through state, federal, and other non-local sources.

3. **CAP measures that are not quantified.** There are a number of CAP measures for which costs are not fully quantified that could have competitiveness effects. For example, Trans-1 recommends amendments to the General Plan that shift land use capacities from outlying areas to the downtown and other "village" areas. While revisions to the City's General Plan are still under consideration, there are two important potential competitiveness effects to be considered:

    - *Impact of Restraining Peripheral Growth.* Restraining development in outlying areas of Stockton could increase land prices in the future when land markets become more competitive (demand and supply are in balance). While this shift would likely negatively affect cost competitiveness, some land owners would enjoy increased asset value.

[2] 2010 Gross Domestic Product as reported by US Department of Commerce, Bureau of Economic Analysis.

- *Impact of Promoting Infill and Urban Intensification.* Adding additional real estate products (e.g., greater amounts of mixed-use development) across a wider range of price points could improve competitiveness by attracting buyers that might otherwise migrate to other urban areas. However, it is important to note that markets (i.e., prospective buyers) for such urban products are not the same as for the surrounding suburban development, and thus levels of demand may be inadequate to support the infill envisioned by the CAP.

EPS notes that Trans-1 represents only 0.26 percent of the total GHG emissions reductions estimated to occur under the CAP. Given the potential competitiveness impact, the City should consider whether land use and transportation policy is a cost effective approach to GHG reduction in Stockton. EPS recommends that additional effort should further define and assess the Trans-1 measure before adoption as an element of the CAP.

Overview of Economic Competitiveness

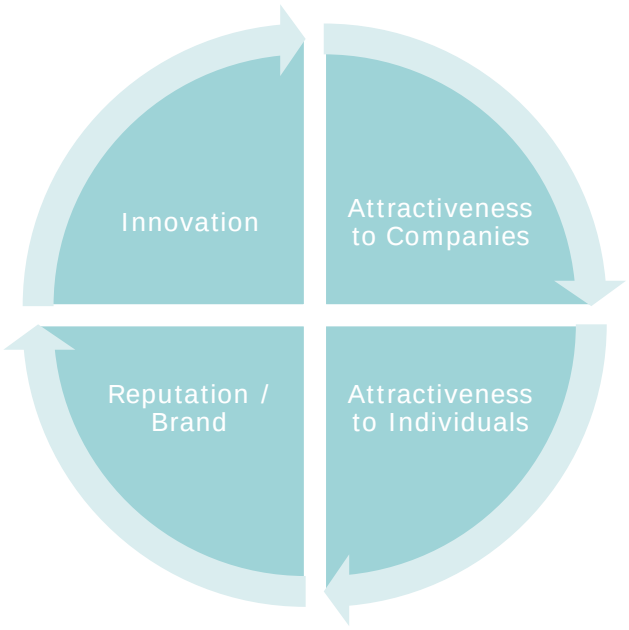
This analysis views competitiveness as an assessment of a city's "value proposition" for businesses and residents, considering the overall quality of the city for commerce and living relative to the cost of locating there. Competitiveness is determined by a multitude of factors, generally categorized here as attractiveness to companies, attractiveness to individuals, reputation/brand, and innovation (i.e., potential for home-grown economic development).

This analysis focuses primarily on the potential effect of the CAP on the attractiveness of Stockton to companies and individuals. Specifically, the analysis considers Stockton's attractiveness from a cost impact perspective, addressing the potential for the CAP to impact business climate and cost of living. That is, attractiveness is potentially affected by the CAP through climate-related measures which create new costs for local businesses and residents.

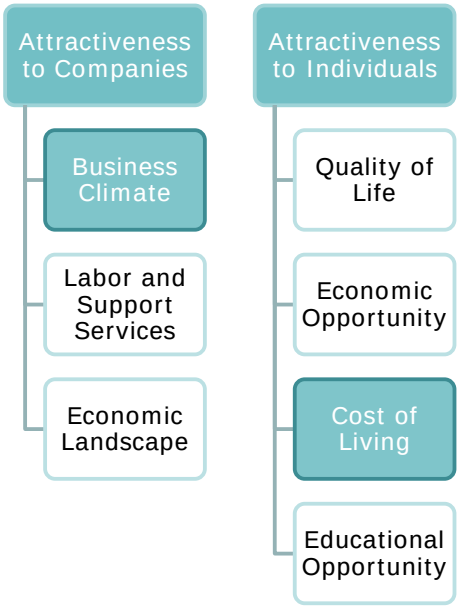
While not considered explicitly by this competitiveness analysis, it is important to note that overall attractiveness can influence a city's reputation/brand and innovation environment, as shown in the conceptual diagram presented in **Figure 1** below. While introducing new costs, the CAP might also create offsetting competitiveness benefits stemming from improved environmental conditions, quality of life, urban vibrancy, and other factors that influence attractiveness, reputation/brand, and innovation.

Figure 1: What is Competitiveness?

General Categories of Competitiveness



Cost-Related Competitiveness Factors



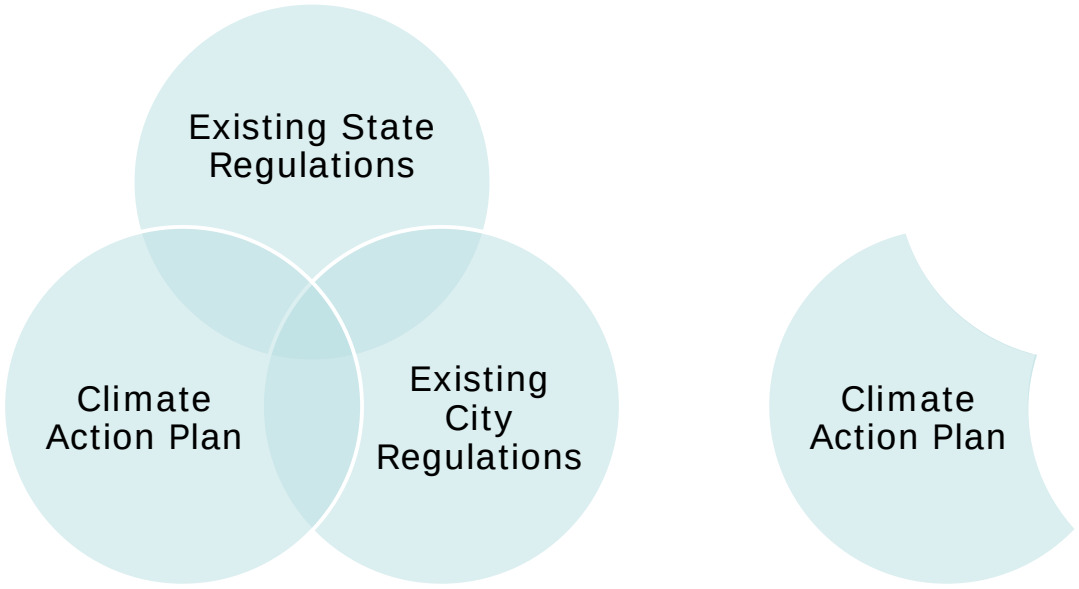
Costs Attributable to the CAP

This competitiveness analysis considers potential marginal changes in the cost of doing business and the cost of living attributable to the CAP. The overall competitive position of Stockton vis-à-vis nearby cities, which is dependent on a myriad of geographic, economic, political, and other advantages/disadvantages is considered the baseline for analysis (i.e., the level from which incremental change attributable to the CAP is measured). Further, EPS has not identified the degree to which cities competing with Stockton may also be planning CAPs or other new regulatory programs. Assuming all else equal, the competitiveness analysis evaluates the CAP for new costs to businesses and residents that would result from adoption of the plan.

There are some existing local and state environmental regulations and policies that contribute to the goals of the CAP and are discussed in the Draft CAP document. Additionally, The San Joaquin Council of Governments is embarking upon a Sustainable Communities Strategy pursuant to SB 375. Those regulations and policies that will exist "but for" (in the absence of) adoption of the CAP are not considered attributable to the CAP, as illustrated in **Figure 2**.

Figure 2: Costs Attributable to the CAP

All CAP-Related Costs *Costs Attributable to the CAP*



Consideration of "cost incidence" also is important to the evaluation of competitiveness effects. Beyond quantifying the total cost of the program, it is essential to recognize who will ultimately bear the cost of the CAP measures. This competitive analysis evaluates the share of CAP costs to be borne by the private sector (businesses and residents) versus the public sector. Some public sector costs may be transferred back to the private sector while other public sector costs may ultimately be paid by non-local public entities. Public sector costs that are charged back to the private sector locally have the potential to affect competitiveness in Stockton.

Stockton Existing Economic Conditions

The City of Stockton has been extremely hard hit by the Great Recession (the U.S. economic recession of 2008-9) and continues to struggle with economic and fiscal conditions that are significantly worse than other areas of the state and nation. Of particular note, the Stockton City Council voted to approve a "pendency" operating budget and has filed for bankruptcy. News sources report that Stockton is the largest city to file for bankruptcy in US history.

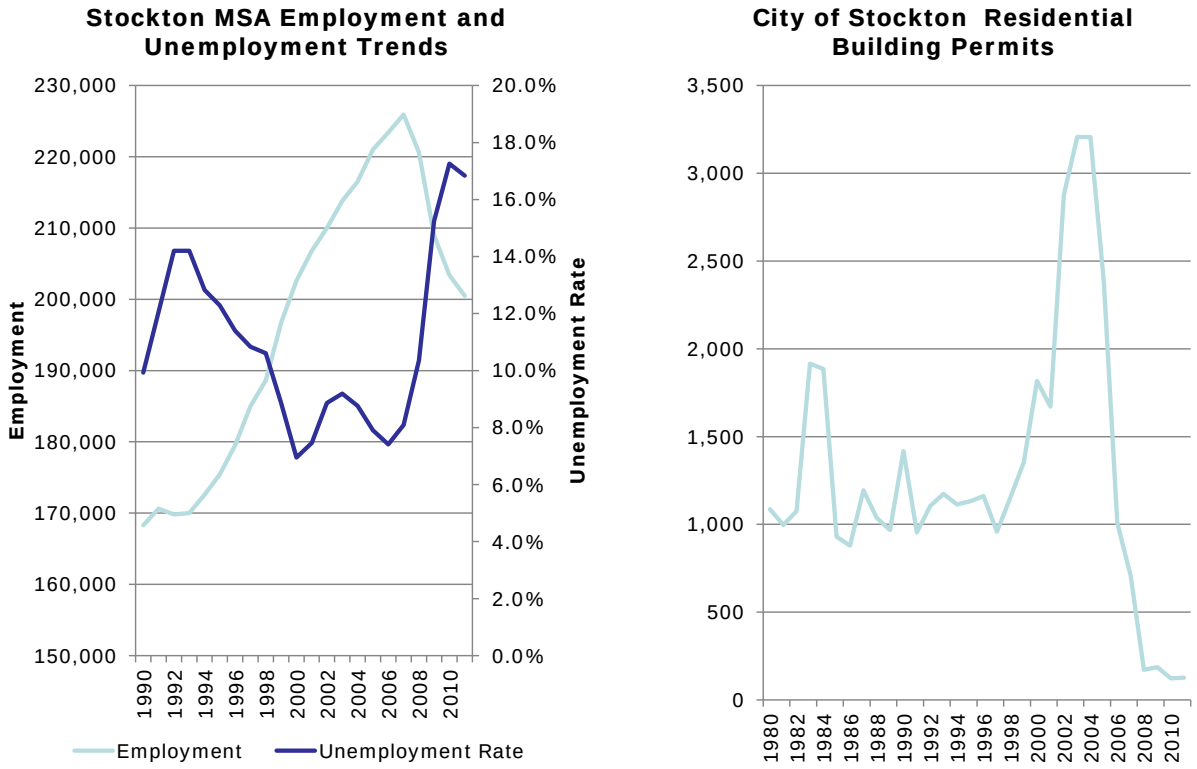
The five points below summarize some of the underlying economic and governance challenges the city currently faces:

- Stockton's economy lacks diversity and is heavily dependent on agriculture, agricultural services, and logistics industries;
- The Great Recession has had a large and persistent impact on the City's economy, concentrated in construction and related professional services;
- The City continues to have some of the highest foreclosure and underwater mortgage rates in the United States;

- Rapid urban expansion and dependence on developer-based financing has led to proportionately high development impact fees; and
- Deteriorated fiscal conditions have diminished the City's ability to invest and provide quality municipal services.

While there are various data trends that illustrate the economic decline in Stockton, the presentation of employment trends and residential building activity in **Figure 3** reveals the sharply negative trajectory of the city's current conditions. While these conditions are not considered explicitly by the competitiveness analysis (i.e., the analysis examines marginal rather than cumulative effects), it is important to acknowledge the economic climate of the City in considering the impact of new costs attributable to the CAP.

Figure 3: Employment and Development Trends



Sources: California Economic Development Department; US Department of Housing and Urban Development; EPS

Other Competitiveness Considerations

While competitiveness is discussed generally above, it is important to consider that competitiveness issues are often related to specific industries and markets. Stockton is a transportation logistics center for Northern California's agricultural and manufacturing sectors as well as a hub for regional government, medical services, education, and retail. In addition to being well served by several state freeways, Stockton's strengths in agricultural and manufacturing are reinforced by the Port of Stockton, one of the only inland ports in the state. Over the years Stockton has attracted substantial private investment in warehouse/distribution and value-added manufacturing uses.

Stockton possesses abundant and inexpensive land resources, and is generally regarded as one of California's less expensive locations for housing and business operations. While Stockton is relatively proximate to major employment centers in the Bay Area and the Sacramento region, the local labor force exhibits a skills gap that has limited growth potential for high-technology enterprises. While some experts had anticipated that Stockton would transition to more high-skilled employment sectors, office and R&D projects have not materialized, despite City investments in downtown and waterfront ventures.

Stockton's primary economic advantages include well-developed transportation infrastructure, agricultural strength, and cost competitiveness. These advantages contribute to the viability of trade and manufacturing businesses, which are marginal or infeasible in other parts of California. With Stockton's economic strengths in notably cost sensitive sectors, even modest cost increases attributable to new regulatory requirements can be detrimental to the local economy.

CAP Competitiveness Evaluation

The City of Stockton CAP seeks to reduce the City's greenhouse gas (GHG) emissions to 10 percent below 2005 levels by 2020. To this end, the CAP recommends a suite of GHG reduction measures that are organized into ten primary categories. Some CAP measures are already required by state and local laws while others are newly introduced by the Draft CAP.

1. **State Programs:** GHG reductions from statewide initiatives will contribute to GHG reductions within Stockton. The cost of these statewide programs is not attributable to the CAP and does not create competitive disadvantages for Stockton as compared with other cities in California.

2. **Development Review Process:** The City currently requires that discretionary projects incorporate emissions reductions as part of the California Environmental Quality Act (CEQA) project approval process. GHG reductions that result from the Development Review Process are not attributable to CAP and similar emissions reductions (or mitigation) would be required by CEQA processes throughout the state, negating the potential competitive disadvantage for Stockton to attract new investment in real estate development. Specifically, the City is following a GHG reduction performance standard that matches the standard recommended by the San Joaquin Air Pollution Control District and is commonly used for project evaluation in many locations throughout the San Joaquin Valley.

3. **Building Energy:** Numerous CAP measures will improve energy efficiency within Stockton's current and future building stock. The City's Green Building Ordinance is mandatory and the associated costs are not attributable to the CAP because adoption of this ordinance is a separate requirement of the Settlement Agreement that has been and will be considered a separable action from the CAP. Further, many major cities in California require similar green building standards, which typically only add about 2 percent to construction costs.[3] Additional new building energy programs proposed in the CAP will be voluntary and thus would not affect competitiveness. However, some public program costs could be passed on to the private sector.

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[3] Average cost premium associated with LEED-certified construction in California (Katz, G., The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force, October 2003).

4. **Land Use and Transportation:** These wide-ranging CAP measures include land use planning, transportation infrastructure, and transportation demand management actions. The CAP proposes that only the Parking Policies measure (Trans-2) will be mandatory while other measures will be voluntary or implemented by the municipality. While private sector costs associated with the Parking Policies are not quantified, the CAP notes that increases in parking costs will be borne by individuals and businesses. EPS anticipates that minor increases in the cost of parking would have negligible effects on the City's economic competitiveness.

   Of concern are the potential effects from the Land Use/Transportation System Design Integration (Trans-1), which calls for General Plan amendments to support infill development. While such measures have the potential to generate a positive impact on GHG emissions, it will be important to assess the market and financial feasibility of any proposed General Plan amendments to determine whether proposed changes will affect Stockton's competitiveness as a location for investments in real estate development. In particular, land use restrictions that limit additional supply of buildable land could drive up land and real estate prices when current supplies of land entitled for development have been consumed. It should be noted that the existing ample supply of entitled land, especially given current and anticipated weak market conditions, would place this effect well into the future. At this future point, if supply is constrained, it is likely that demand for low-density residential development would simply shift, at least in part, to other geographic areas in the region. Higher-density urban infill will not serve as a local substitute for the low-density uses sought by the market. Achieving high-density infill development will require increased market support for urban real estate product types, at price points adequate to overcome the cost premiums associated with infill site challenges (e.g., redeveloping existing built sites) and high-density construction.

   Trans-1 also seeks to promote greater land use diversity in Stockton by requiring a balance of jobs and housing in all new village areas (as defined in the General Plan) and throughout the City. Achieving commercial uses in each of the new village areas may be challenging because of market and financial feasibility constraints. These additional requirements might affect land values, real estate development viability, and competitiveness. As such, proposed General Plan amendments should be carefully considered for potential economic and financial feasibility so that any effects on competitiveness may be avoided.

   Other measures, Safe Routes to School (Trans-7a and Trans-8a), require a one-time capital cost to the City of $15 million. However, ICF has indicated that the two transportation measures may be partially or substantially funded by state or federal grants. Some public costs could be passed on to the private sector but they are not likely to be significant relative to the considerable public safety gains and potential for reductions in GHG emissions.

5. **Waste:** The CAP waste generation measure calls for increased diversion of waste from landfills to recycling and other related programs, with the City achieving a 75 percent diversion rate by 2020, consistent with the statewide goal established by AB 341 in 2011. The CAP estimates the net cost of diversion at $69 per ton recycled, to be borne by private waste service providers within the City, or passed on to service consumers including local residents and businesses. The CAP estimates the annual cost of the waste measure at $5.8 million, which translates to less than $15 per person per year when the cost is distributed across the city's population and job base. While not insignificant, this cost burden is unlikely to affect competitiveness measurably.

6. **Water:** The two CAP water efficiency measures are (1) mandatory compliance with Senate Bill X7-7, a baseline requirement for state water agencies and (2) voluntary water efficiency programs to be administered by the City. The cost of compliance with SB X7-7 is not attributable to the CAP and does not create a competitive disadvantage for Stockton as compared with other cities in California. Also, the City's encouragement of voluntary water efficiency and retrofit programs would not affect economic competitiveness.

7. **Wastewater:** The CAP references Stockton's existing Capital Improvement and Energy Management Plan as the guide for actions to reduce energy usage at the Regional Wastewater Control Facility. The actions would be funded by public sources and would be unlikely to affect competitiveness directly, though costs could be passed on to the private sector.

8. **Urban Forestry:** The CAP proposes continuation of the City's tree planting programs. These programs would be funded by public sources and would be unlikely to negatively affect the City's economic competitiveness directly, though costs could be passed on to the private sector.

9. **High Global Warming Potential GHGs:** The CAP recommends that the City of Stockton would contract with a solid waste services company to establish a Responsible Appliance Disposal drop-off center in Stockton. This program would be funded by public sources and would be unlikely to affect competitiveness directly, though some costs could be passed on to the private sector.

10. **Off Road Vehicles:** The CAP proposes three measures to reduce GHGs associated with off-road construction equipment and other off-road vehicles. A program to reduce idling construction equipment (Off-Road-2) will be mandatory and will create a new cost burden for construction companies. The program would create a one-time capital expense which would most likely be passed on to consumers. However, once amortized and considered within the context of total construction project costs, the marginal cost increase associated with this mandatory CAP measure is relatively minimal and unlikely to affect the City's competitiveness measurably.

Land Use and Transportation Policy

There has been considerable emphasis placed upon how land use policy can be part of meeting CAP GHG reduction targets in Stockton as well as other jurisdictions and regions engaged in GHG reduction efforts. It is the opinion of EPS that CAP measures related to land use planning have the potential to create competitiveness effects, if implemented in a highly restrictive fashion. While actual GHG emissions reductions associated with land use and transportation policy are highly uncertain, EPS notes that the draft CAP estimates that Land Use/Transportation System Design Integration (Trans-1) will result in a GHG emissions reduction of only 1,440 to 7,181 metric tons of carbon dioxide equivalent ($MTCO_2e$). This represents a small portion of the total GHG emissions reductions estimated to occur under the CAP. Given the potential competitiveness impact of the Trans-1 measure relative to the benefits generated toward the goal of the CAP, the City should consider whether land use and transportation policy is a cost effective approach to GHG reduction in Stockton. EPS recommends that additional effort should further define and assess the Trans-1 measure before adoption as a mandatory element of the CAP.

City Implementation Costs

As discussed above, in addition to private investment in voluntary and mandatory measures, the City will have implementation costs including both capital investments and ongoing administrative costs, as documented in Chapter 4 of the Draft CAP. The Draft CAP identifies approximately $29.9 million in one-time City costs and an additional $140,000 in annual staffing costs[4] (see **Figure 4**). While the additional annual operating cost can be offset through annual savings, the nearly $30 million in one-time capital cost attributable to the CAP equates to nearly 6 percent of the City's 2010-11 adopted City-wide budget.

Of note, Land Use and Transportation Measures including Safe Routes to School (Trans-7a/Trans-8a) and Reduce Barriers for Non-Motorized Travel (Trans-5) have relatively high one-time capital costs, $15 million and $6.1 million, respectively. It is anticipated that over time non-local funds will be available for these measures, thus lowering any local cost burdens. Outdoor Lighting Upgrades (Energy 2a) also has a relatively high upfront cost of $5.8 million, though ICF expects that this measure produces annual energy cost savings for the City.

The degree to which local funds are needed and those funding requirements are passed on to the private sector as new costs will determine the competitiveness effects from the CAP's public costs. The feasibility of absorbing additional costs, however locally funded, must be placed in the context of the existing real estate market downturn and the City's ongoing fiscal crisis. Substantial new costs may not be feasible for the City in the near term. However, the relatively limited net-local costs involved in CAP implementation and the opportunity to incur these costs over time suggest that impacts on competitiveness resulting from the City's implementation costs will be limited.

Potential Economic Benefits

It is important to acknowledge that the CAP may have other economic effects (in addition to potential effects on competiveness), including financial returns on related investments and regional economic benefits. These effects could be considered as part of a future economic evaluation of CAP benefits that offset negative cost-related competitiveness impacts. For example, expenditures on a number of CAP measures would generate cost savings, a form of financial return on investment. The Draft CAP includes five voluntary energy measures for the private sector (e.g., lighting, energy efficiency, and solar programs, Measures Energy-2b, 3, 4, 5 and 6) that could generate $19 million to $25 million in net annual savings to ratepayers in 2020, depending on the financing approach to solar measures (low range is power-purchase agreement scenario; high range is owner-financed scenario). With a solar power-purchase scenario, ICF estimated upfront costs as $48 million and net present value of these energy measures of $204 million.[5] With a solar owner-financed scenario, ICF estimates upfront costs of $406 million and net present value of these energy measures of $84 million.[6] While these voluntary programs (other than the municipal lighting measure, which is mandatory) are unlikely

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[4] Staff has identified need for one dedicated full-time equivalent staff position for implementation of the CAP. Other staff are assumed to also work on the CAP as part of their existing duties. Annual staffing costs may be offset by annual operations and maintenance savings.

[5] From the building owner perspective, excluding solar provider upfront and maintenance costs.

[6] From the building owner perspective, including building owner upfront and maintenance costs.

to affect competitiveness, they could increase awareness of the potential financial benefits associated with energy efficiency building upgrades. In addition, local spending associated with these energy measures likely would create regional economic benefits through the generation of new expenditures that supports jobs, employee compensation, and "multiplier effects" as the initial new spending ripples through the City and County. In an economy that is currently experiencing high unemployment, such regional economic effects have the potential to provide meaningful benefits to local residents.

Figure 4: Summary of Stockton CAP Measures

Measure #	Measure Description	Legislation	Measure Detail	One-Time City	Annual O &M (2014 – 2020) City	One-Time Private	Net Annual (2020) Private	Lifetime	Burden[1]
State Measures	Various (Table 3-5)	Various	Statewide initiatives that will contribute to GHG reductions in Stockton						Various
DRP-1	Development review process	CEQA	New development projects to reduce emissions (below significance threshold per SJACD)						M
Energy-1	Existing green building ordinance	City Green Building Ordinance	Energy efficiency technology for new development consistent with CA Title 24 standards						M
Energy-2a	Outdoor lighting upgrades (municipal)	CAP	Replace 50% of streetlights with LED bulbs	$5,835,000	$(650,000)	$-	$-	5-17	City
Energy-2b	Outdoor lighting upgrades (private)	CAP	Private lightbulb replacement with energy-efficient bulbs	$ 105,000	$(60,000)	$5,000,000	$ (2,200,000)	9-11	V
Energy-3	Energy efficiency programs (residential)	CAP	Energy assessments and retrofits for existing residential structures			$37,500,000	$ (6,000,000)	18	V
Energy-4	Energy efficiency programs (commercial)	CAP	Energy efficiency upgrades for existing non-residential structures			$5,300,000	$ (4,600,000)	18	V
Energy-5a	Solar-powered parking (Owner-financed)	CAP	Solar panels on carports	$ 70,000	$--	$38,400,000	$ (1,600,000)	25	V
Energy-5b	Solar-powered parking (PPA financed)					$-	$ (1,000,000)	30	V
Energy-6a	Rooftop solar (Owner-financed)	CA	Rooftop solar for existing residential and non-residential structures			$319,700,000	$ (10,400,000)	25	V
Energy-6b	Rooftop solar (PPA financed)					$-	$ (5,600,000)	30	V
Trans-1	Land use/transportation design (300 units dtn)	CAP	General plan amendments for downtown housing and non-residential in new village areas	$ 70,000	$ --		$(2,400,000)	30+	City/V
Trans-1	Land use/transportation design (3000 units dtn)						$(12,000,000)	30+	City/V
Trans-2	Parking policy	CAP	Increased parking costs downtown, rideshare, incentives not to park	$ 54,600	$ --		$(2,600,000)	9	M
Trans-3	Transit system support	CAP	Signal priority, bus shelters, park and ride	$ 675,000	$49,000		$(2,100,000)	12 / 20	City/V
Trans-4	Goods movement	None/already planned	Grade-separated crossings	NA	NA				City/V
Trans-5	Non-motorized travel	CAP	Bikeway construction	$6,170,000	$135,000		$(2,400,000)	20	City
Trans-6	Transit system improvements	CAP	Maintain current mode share	$115,000	$ --	RTD costs not included			City/RTD
Trans-7	Safe routes to school	CAP	Pedestrian crossings, walking school bus, education	$15,406,000	$345,000		$ (3,300,000)	20	City
Trans-8a	Transportation demand management	CAP	Additional safe routes to school				$ (3,300,000)	20	City/V
Trans-8b	Transportation demand management	CAP	Transportation demand program for large employers	$70,000	$--		$ (5,200,000)	20	V
Waste-1	Increased waste diversion	CAP	Education campaign to increase waste diversion	$105,000	$--		$5,800,000	9	M
Water-1	Comply with SB X7-7	State law	Best management practices and water tracking						M
Water-2	Water efficiency (existing development)	CAP (In part)	Water efficiency and retrofits for existing structures	$22,000	$ --	$12,000,000	$(1,500,000)	10	V
Wastewater-1	Energy efficiency (RWCF)	CAP	Implementation of City Energy Management Plan	$370,000	$(150,000)			5-10	City
Urban Forestry-1	Urban tree planting	CAP (In part)	Tree planting	$625,000	$120,000			40	City
HGWP GHG-1	Appliance disposal (residential)	CAP	Vendor-run responsible appliance disposal program	$35,000	$--			9	City
Off-Road-1	Electric construction equipment	CAP	Incentives for construction firms to electrify their fleets	$126,000	$--			9	V
Off-Road-2	Reduced idling for construction equipment	CAP	City ordinance to limit heavy-duty off-road equipment idling using current technologies			$8,150,000	$(500,000)	9	M
Off-Road-3	Electric landscaping equipment	CAP	City goal to electrify landscaping equipment					9	V
Additional Annual Staffing Costs (1 FTE; all measures)					*$140,000*				
TOTAL (Owner-Financed Scenario for Measures Energy-5 & 6; 3000 units for Trans-1)				***$29,853,600***	***$(11,000)***	***$426,050,000***	***$(51,900,000)***		
TOTAL (PPA-Financed Scenario for Measures Energy-5 & 6; 300 units for Trans-1)						***$67,950,000***	***$(36,900,000)***		

[1] "M" is mandatory; "V" is voluntary; and "City" is a municipal action